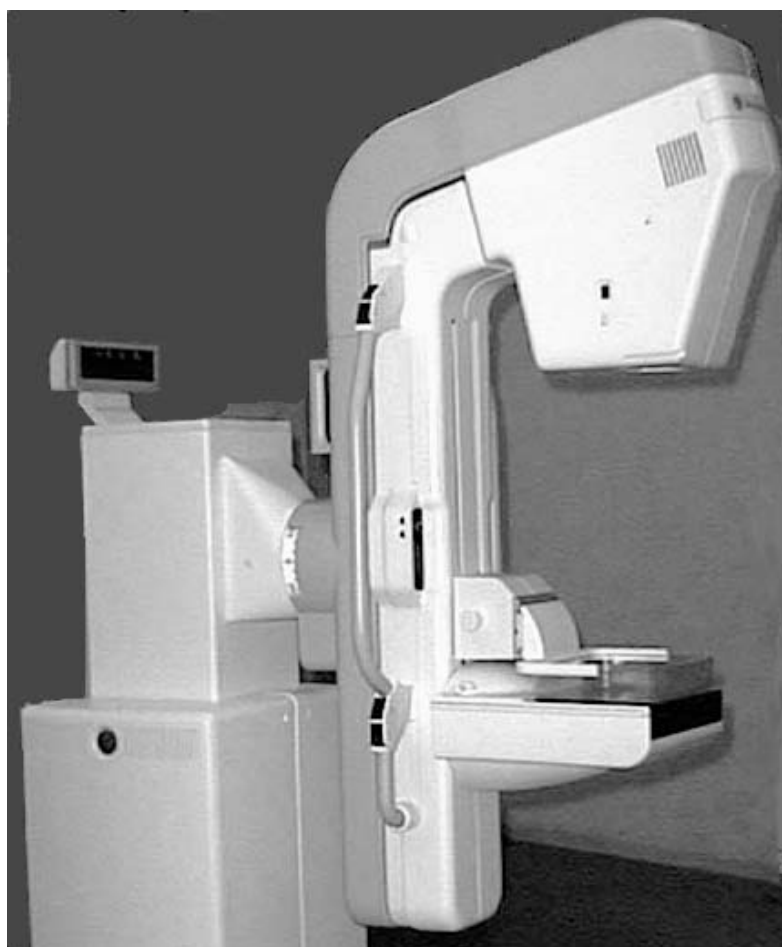


GE Healthcare

# Senographe 2000 D Acquisition System

Operator Manual  
OM

CE 0459

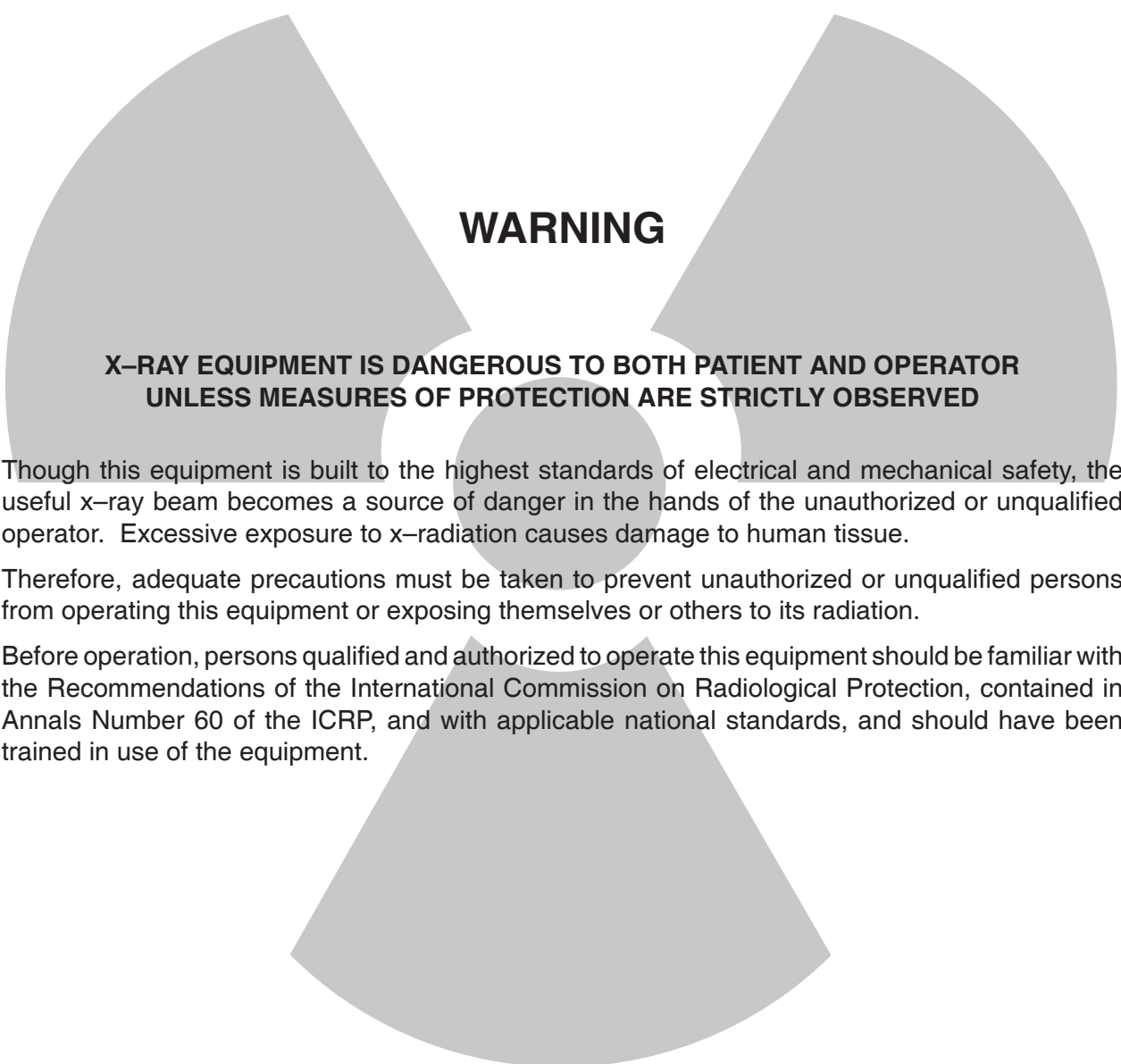


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## **WARNING**

**X-RAY EQUIPMENT IS DANGEROUS TO BOTH PATIENT AND OPERATOR  
UNLESS MEASURES OF PROTECTION ARE STRICTLY OBSERVED**

Though this equipment is built to the highest standards of electrical and mechanical safety, the useful x-ray beam becomes a source of danger in the hands of the unauthorized or unqualified operator. Excessive exposure to x-radiation causes damage to human tissue.

Therefore, adequate precautions must be taken to prevent unauthorized or unqualified persons from operating this equipment or exposing themselves or others to its radiation.

Before operation, persons qualified and authorized to operate this equipment should be familiar with the Recommendations of the International Commission on Radiological Protection, contained in Annals Number 60 of the ICRP, and with applicable national standards, and should have been trained in use of the equipment.

## REGULATORY REQUIREMENTS

This product complies with the regulatory requirements of the following:

- ☐ Council Directive 93/42/EEC concerning medical devices: the  label affixed to the product testifies compliance to the Directive.

For a system, the location of the CE marking label is described in the system manual.

European registered place of business:

*GE Medical Systems Europe*  
Quality Assurance Manager  
BP 34  
F 78533 BUC CEDEX France  
Tel: +33 (0)1 30 70 40 40

- ☐ Code of Federal Regulations Title 21, Subchapter J – Radiological Health.
- ☐ Underwriters' Laboratories, Inc. (UL), an independent testing laboratory.
- ☐ Canadian Standards Association (CSA).
- ☐ International Electrotechnical Commission (IEC), international standards organization, when applicable.

Compliance with these standards is evidenced by the presence of the appropriate labels on the exterior of the Generator cabinet.

- ☐ USA/HHS:



**United States Federal law restricts this device to use by or on the order of a physician.**

- ☐ *General Electric Medical Systems* is ISO 9001 and EN 46001 certified.
- ☐ The original document was written in English.

### Use within the patient environment

All components of the Senographe 2000 D system (Generator Cabinet, Gantry, Acquisition WorkStation Cart) are designed to be suitable for use within the patient environment, and are compliant with the relevant standards (UL 2601, IEC 601.1.1).

## IMAGE ANNOTATIONS

**Note:** Since the equipment allows the physician to store information on the patient with the function IMAGE ANNOTATIONS, the European Directive regarding “the protection of the people with regard of data management on their private life and to the free circulation of these data” requests to the computerized file users (radiologists, physicians) not to store data related to their:

- race,
- philosophical opinions,
- religious opinions,
- political opinions,
- etc.

## Electromagnetic Compatibility (EMC)

This equipment complies with IEC60601-1-2 Edition 2 EMC standard for medical devices.

This equipment generates, uses, and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with radiated emissions as per CISPR11 Group 1, Class A standard limits.

Detailed requirements and recommendations about power supply distribution and installation are listed in the Pre-Installation Manual (pim) shipped with your system. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment is found to cause interference (which may be determined by turning the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

- reorient or relocate the affected device(s)
- increase the separation between the equipment and the affected device
- power the equipment from a source different from that of the affected device
- consult the point of purchase or service representative for further suggestions

The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

All interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference.

Do not use devices which intentionally transmit RF Signals (Cellular Phones, Transceivers, or Radio Controlled Products) in the vicinity of this equipment as it may cause performance outside the published specifications. Recommended separation distances are detailed in the Pre-Installation Manual (pim) shipped with your system. Keep the power to this type of devices turned off when near this equipment.

The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who may be around this equipment to comply fully with the above requirement.

Further data and recommendations for meeting Electromagnetic Compatibility requirements for a typical installation are given in the Pre-Installation Manual (pim) shipped with your system. Note that the magnetic field of an MRI device located nearby may cause a risk of interference. Magnetic field amplitude limits are specified in the Pre-Installation Manual (pim) shipped with your system.

**Recycling:****Machines or accessories at end-of-life:**

The elimination of machines and accessories must be in accordance with national regulations for waste processing.

All materials and components that could pose a risk to the environment must be removed from the end-of-life machines and accessories (examples: dry and wet cell batteries, transformer oil, etc.).

Please consult your local General Electric Medical Systems representative before discarding these products.

**Packing materials:**

The materials used to pack our equipment are recyclable. They must be collected and processed in accordance with the regulations in force for the country where the machines or accessories are unpacked.

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## FOREWORD

This manual is provided for Senographe 2000 D operators. It is designed to supply all the information required for the correct use of this equipment.

The manual has been written to describe the use of the Senographe 2000 D in its most complete configuration. If any of the options described in this manual are not included in your system, skip the corresponding chapter or sections.

See your General Electric Medical Systems representative for the options available with the Senographe 2000 D system.

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## CHAPTER 1 – SAFETY RECOMMENDATIONS

### 1. INTRODUCTION

Routine mammography provides the best method of early detection of breast cancer, and every effort should be made to encourage its acceptance by patients and all concerned organizations. Examinations performed regularly without problems are an essential part of this process. All aspects of mammographic exams, and especially safety, must be optimized to ensure effective diagnosis and allow the development of screening programs.

Safety precautions and recommendations for the avoidance of potential hazards, and against misuse, are given throughout this document. They must be made known to, and be practised by, all operators of the Senographe 2000 D equipment.

This chapter is intended to bring attention to and emphasize some of the more important of these precautions and recommendations.

You are strongly recommended to keep this manual with the equipment at all times. Review it from time to time and be sure that you are familiar with all aspects of use of the equipment, and especially those affecting safety.

*Stop all examinations and call your GEMS (General Electric Medical Systems) Service representative immediately if you believe that the equipment is not operating correctly.*

### 2. POTENTIAL ADVERSE EFFECTS

- The following is a list of potential adverse effects that apply to mammography and are also applicable to digital mammography using the Senographe 2000 D system:
  - Excessive breast compression
  - Excessive X-ray exposure
  - Electric shock
  - Infection
  - Skin irritation, abrasions, or puncture wounds

### 3. EMERGENCY SWITCHES

- Emergency stop switches are provided on both sides of the Senographe 2000 D Gantry examination column, easily accessible to the operator.  
Push either of these switches to immediately cut power to the examination column.  
All movements are stopped, and any compression which may have been applied to the patient during an exam is released.
- If an emergency arises which requires complete removal of power from all parts of the system, the mains isolator which supplies power to the system from the hospital supply must be switched off. Find out where this isolator is located and how to operate it.

Note that all image and patient information being processed at the time of cutting power will be lost, and that power for the environmental control of the Digital Detector will be cut (this may entail a delay before the system can be brought back into use).

## 4. MOVEABLE COMPONENTS

The equipment includes a number of moveable components.

Users must be instructed to monitor all movements, and to take all due care and precautions when moving any part of the equipment in the vicinity of themselves or other persons.

To ensure safe operation at all times, the Senographe 2000 D compression system is fitted with a magnetic braking mechanism, which prevents the compression paddle from falling in the event of power loss. If power loss does occur while a patient is under compression, a force of around 5 daN remains on the compression paddle. Disengage the patient by raising the paddle gently by hand (do not try to raise it too quickly) to counteract the compression force.

To minimize potential injury to the patient in decompression mode, the upward movement of the compression paddle is stopped if a downward force greater than 3 daN is applied.

## 5. BEFORE STARTING AN EXAM

### Check the system:

- Check that the compression paddles, the Bucky (grid) or breast support, and the magnification platform if in use, are all well inserted in their supports, and are being used as recommended.
- The magnification platform must *not* be used when the column is rotated outside the range  $+90^\circ$  to  $-90^\circ$ . In this position, it is possible for the patient's abdomen to obscure the field of view.
- No modifications to system hardware or software may be made without prior approval from GEMS. GEMS cannot guarantee the integrity of the system if this recommendation is not followed.
- No application programs of any sort may be loaded onto the system computer without prior approval from GEMS. GEMS cannot guarantee the integrity of the system if this recommendation is not followed.
- Only accessories and components supplied by or specifically recommended by GEMS may be used with the system. GEMS cannot guarantee the integrity of the system if this recommendation is not followed.
- Only Senographe 2000 D compression paddles may be used with the system. Use of other paddles may adversely affect image quality by causing inaccurate measurements of breast thickness.
- All accessories should be checked regularly to ensure that they have no sharp edges or corners which might cut, pinch, or otherwise hurt a patient.

### Check the patient:

Before beginning the mammogram, observe the following points:

- Before positioning the patient, make a visual assessment of the breast area, and note anything which may affect or be adversely affected by the correct positioning of the breast for the mammogram, for example, warts, scarring, or skin which is not intact. In patients with large breasts, perspiration under the breast can cause the skin to soften, and become paper-thin.

To position the breast properly for a mammogram in the CC position, it is essential that the breast is lifted away from the chest wall and gently pulled forward, in order to visualize the maximum amount of breast tissue. Such pulling and lifting is necessary for correct positioning, but can cause damaged skin to tear slightly, and may cause bleeding.

If any condition exists which may cause unusual discomfort or tearing of the skin, the patient should be told of the importance of correct positioning, and should be warned in advance of the possibility that minor tearing and /or slight bleeding might occur.

- Use suitable techniques for the positioning of patients with breast implants.
- It is normal that the front part of the breast support is warm to the touch, as it contains electronic components which generate heat. However, the temperature is never high enough to be harmful.

To ensure that examinations are carried out under optimum conditions, any unusual rise in temperature causes a warning message to be displayed on the monitor screen, forbidding examinations. Any further rise causes the detector system to be automatically shut down.

- GEMS can take no responsibility for injury to the patient caused by the use of heating or warming devices external to the system.

## 6. ACQUISITION AND STORAGE OF IMAGES

Images acquired during examinations are stored on an internal disk system for preliminary assessment, before permanent archiving or printing to film. The system is designed to avoid all foreseeable problems during the acquisition and storage operations. Precautions include continuous checks on all components and the provision of a battery-backed UPS (Uninterruptable Power Supply), to allow correct processing of images to be completed before shutdown in the event of a power failure.

Certain conditions may cause a loss in the ability of the system to acquire high quality images or a risk that images might not be correctly saved (for example, if the UPS batteries are not sufficiently charged to ensure correct shutdown). For these conditions a warning message is displayed on the AWS monitor and/or the Gantry Control Console. A list of possible error messages, with explanations and suggested actions, is given in Chapter 14. "Error Messages".

You should note the following recommendations:

- Always follow the correct system shutdown procedure as described in Chapter 6 "Startup and Shutdown".
- In spite of the presence of the UPS, it is not advisable to switch off power while an image is being processed and stored.
- If defects or failures on the disk system are observed, *call your GEMS Service representative*. It may be possible to recover information on the disk if the damage is not too severe.

## 7. AOP MODE

The Senographe 2000 D provides an AOP (Automatic Optimization of Parameters) operating mode. This mode is designed to optimize image quality for the examination of breasts with a compressed thickness between 10 mm (0.4 inch) and 85 mm (3.35 inches).

However, there are some types of examination for which manual selection of parameters may be more suitable. These are discussed in Chapter 10, Image Acquisition Procedure.

## 8. RESIDUAL IMAGES

Repeated exposures made with a high contrast object in the digital detector area may lead to the creation of a ghost image, caused by an excessive difference of residual charges between cells of the detector. The time taken for this ghost image to disappear depends upon the magnitude of the residual charges.

This effect can occur during checks to measure the X-ray field which use a dosimeter ionization chamber in the beam. To avoid it, use one of the following solutions:

- Reduce the contrast of the object by including it in a field protected by an X-ray attenuator of adequate thickness.
- Use the internal dose measurement facility.
- Protect the digital detector by means of a 3 mm steel plate for the duration of the measurements.

## 9. DAMAGE TO THE DIGITAL DETECTOR

The digital detector contains thallium doped cesium iodide, a substance which requires special precautions for handling and recycling. If the protective casing of the digital detector sustains damage, please consult your local GEMS representative.



**If the digital detector casing is punctured, the detector must be removed by authorized GE Service personnel wearing protective gloves and dust masks; send the protective items for disposal along with the defective detector.**

## CHAPTER 2 – INTRODUCTION

### 1. DEVICE DESCRIPTION

Senographe 2000 D is the new Digital Mammography System from GE Medical Systems. It has been designed to perform Screening examinations as well as Diagnostic Views (including Spot compression, Magnified and/or Coned views). It is a *modular* system that eliminates the need for film cassettes, and takes advantage of digital technology, including on-screen image display, Networking, Filming, and Archiving.

The Senographe 2000 D is equipped with a dual track X-ray tube (molybdenum/rhodium) and a digital detector. The digital detector is a flat panel of amorphous silicon on which cesium iodide is deposited to maximize detection of X-rays. Positioning operations and X-ray exposure are controlled by the Control Panel which also controls power to all parts of the Senographe 2000D system.

- Senographe 2000 D's digital technology offers the capability to acquire Images in near-real time and to process them, with the ability to vary brightness and contrast levels and manipulate images.
- It also offers high examination productivity as compared with screen/film, and introduces new applications such as Networking and Archiving.
- Senographe 2000 D is built on the DMR Platform, recognized for Image Quality superiority. The Rhodium spectrum of the Senographe 2000 D's tube is well adapted to Digital Imaging.

The Senographe 2000 D includes an acquisition workstation ("AWS") monitor, keyboard and mouse, computer, electronics, accessory storage, and uninterruptible power supply. The AWS is used for image acquisition, processing, and display. The AWS can also be used for database management, and can send images to archive, review, or filming.

- The Acquisition Workstation displays acquired images in the room, allowing immediate evaluation of breast positioning and possible motion blur, or adjustment of brightness and contrast.

Archiving, Networking, and Filming are all possible from the Acquisition Workstation, which can produce any number of equally high quality film copies as needed.

A hard-copy laser-film printer may be used for image interpretation. Printer window width and window level are set automatically, based on the image content. Images are displayed per film 1 on 1.

The Acquisition Workstation can also display and print SCPT (Secondary Capture) images (if they have the modality MG). This allows the user to view images which have been reviewed and annotated on a Senographe 2000 D review workstation.

Several options are available for use with the Senographe 2000 D system. These options include a Senographe 2000 D review workstation, a mass archiving system, a laser camera, networking capabilities, and CD-ROM interchange media.

- The optional Review Workstation is a stand-alone workstation, with its own dedicated computer and image database, connected to the Acquisition workstation by a high speed link. It supports image display and manipulation.

This powerful computer is equipped with two dedicated, very high resolution B & W monitors and a dedicated keypad. Networking is possible from this workstation, as well as printing and receiving images from an archive device.

## 2. INDICATIONS FOR USE

The Senographe 2000 D system generates digital mammographic images which can be used for screening and diagnosis of breast cancer.

The Senographe 2000 D system is intended to be used in the same clinical applications as traditional mammographic film/screen systems.

## 3. CONTRAINDICATIONS

There are no known contraindications.

## 4. TRAINING PROGRAM

Users must ensure that they receive training on the Senographe 2000D with GE Medical Systems training programs prior to use on patients. GE Medical System training programs will address the new MQSA training regulations in product labeling to ensure that prospective users are aware of the required eight hours of training for any medical physicist, technologist, or interpreting physician.

## 5. HOW TO USE THE MANUAL

Because of the ergonomic graphical interface, you will find the Senographe 2000 D easy to use.

You should take time to study the manual to become fully familiar with all features, and to learn how to use the more complex functions to their full extent.

The manual contains safety and regulatory information that you must be familiar with before using the system.

The notes below describe the organization of the manual.

The Regulatory Requirements at the beginning of this manual (pages 1 and 2) and the chapter on Safety Recommendations (chapter 1) are extremely important, describing safety and regulatory issues that you *must* thoroughly understand *before* attempting to use the Senographe 2000 D system.

The remainder of this introductory chapter contains a general description of system features. Chapters 3 and 4 are dedicated to operations in the Senographe 2000 D.

*To become familiar with the windows, menus, and controls* used on the Senographe 2000 D workstation, refer to Chapter 5 “Acquisition Workstation”.

The *Browser* is the main window used to start the other Senographe 2000 D applications, or to select images for review, transfer or archiving. See Chapter 7 “Browser” for a description of its functions.

*A guide to standard procedures for performing an image acquisition* is given in Chapter 10 “Image Acquisition Procedure”.

*To transfer images* to other workstations or to a mass archiver, consult the appropriate section in Chapter 7 “Browser”.

*To save images* on recordable CDs for communication purposes, consult Chapter 13 “Interchange Media”.

Some of the *terms* in this manual are specific to medical imaging systems or to the Senographe 2000 D system.

## 6. QUALITY CONTROL

To assure continued high level operation of the Senographe 2000D, the recommended quality control procedures described in Senographe 2000 D QAP QC Manual, and the recommended planned maintenance procedures described in Section 2 of Chapter 13, should be performed.

## 7. CONVENTIONS FOR THIS MANUAL

### 7-1 Typographical

Throughout the text in this manual, certain type styles and symbols are used to differentiate between one tool or graphic and another:

- Menu titles appear in bold face: **Application** menu.
- Menu options appear in bold face, within brackets: **[Exit]**.
- Graphical buttons appear in bold face, within parentheses: **(View)**.
- On-screen tools appear in bold face, within braces: **{Scroll Bar}**.
- On-screen prompts and messages appear in italics: *Login*.
- User typed-in responses appear in bold face italics: ***Senographe 2000 D***.
- Keyboard hardkeys and mouse buttons are underlined: Enter or left.

### 7-2 Definitions

The various safety and cautionary notes throughout this manual are defined as follows:



**A HAZARD EXISTS THAT WILL CAUSE SERIOUS INJURY.**



**A HAZARD EXISTS, THAT COULD CAUSE SERIOUS INJURY.**



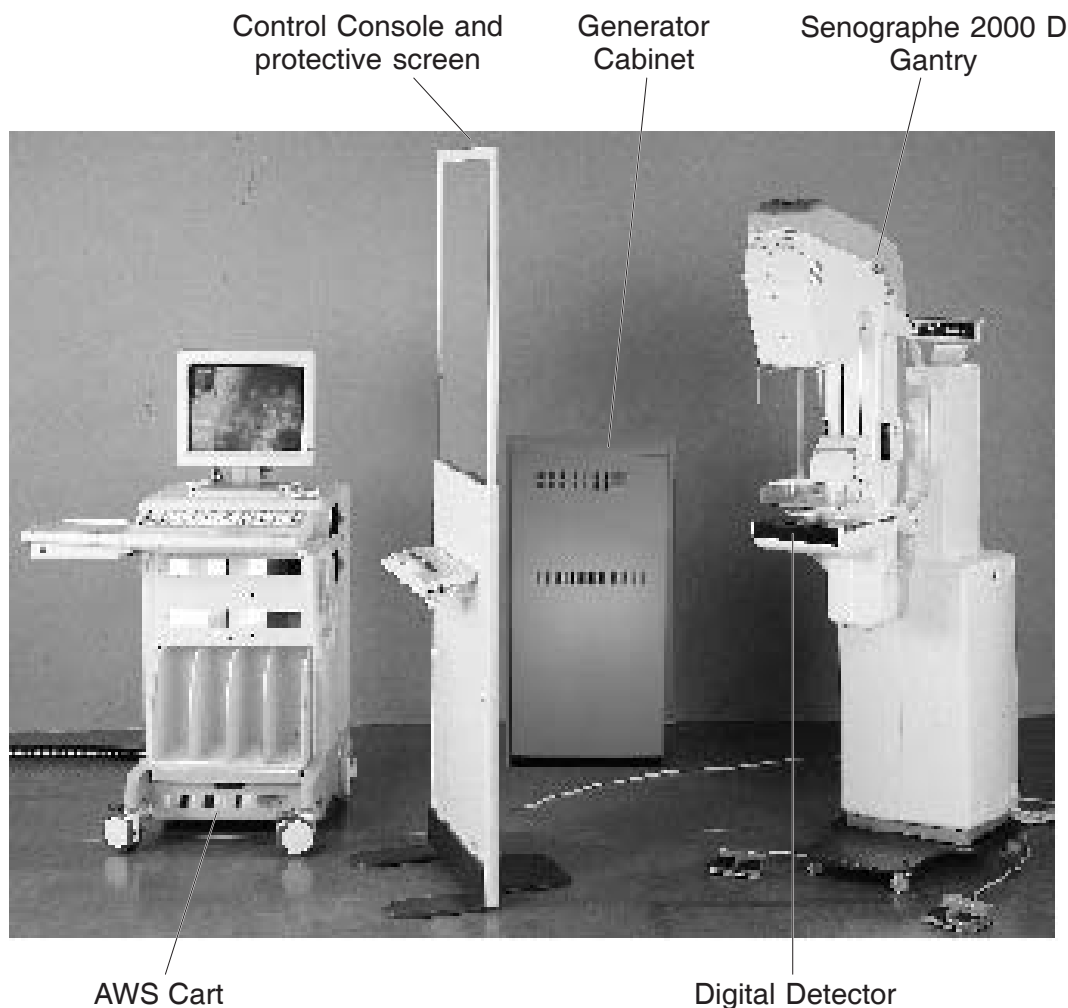
**A hazard exists that will or could cause minor injury.**



**Used for instructions to the user to prevent damage to property.**

**Note:** Used to draw attention to information that is important for the user to know.

## 8. SYSTEM COMPONENTS



### 8-1 Overview

1. The Senographe 2000 D Gantry is equipped with a digital detector. Gantry operations and X-ray exposures are controlled by the Control Console, usually mounted on a protective screen, which also controls power to all parts of the Senographe 2000 D system.
2. The Senographe 2000 D Cart includes the AWS monitor, keyboard and mouse, computer, electronics, accessory storage, and UPS (Uninterruptable Power Supply).
3. Accessories (standard and optional).

The following sections describe each of these components.

### 8-2 Senographe 2000 D X-ray System

The Senographe 2000 D is equipped with a dual track X-ray tube (molybdenum/rhodium) and a digital detector. Mammographic examinations can be made with standing, sitting, or recumbent patients; both contact and magnification views are available.

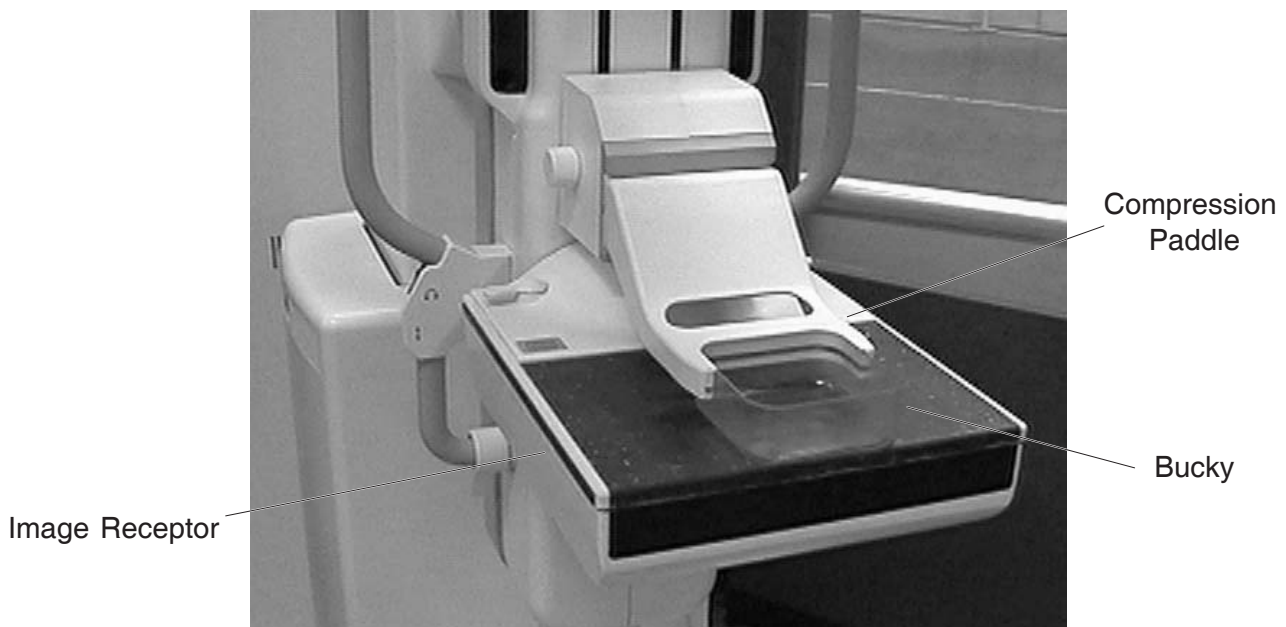
Images are acquired by direct digitization; they are displayed immediately on the AWS monitor and are stored for later diagnostic review. They can be processed and/or filmed.

AOP (Automatic Optimization of Parameters) and manual setting modes are provided for control of X-ray parameters; the system provides auto-collimation and other leading features.

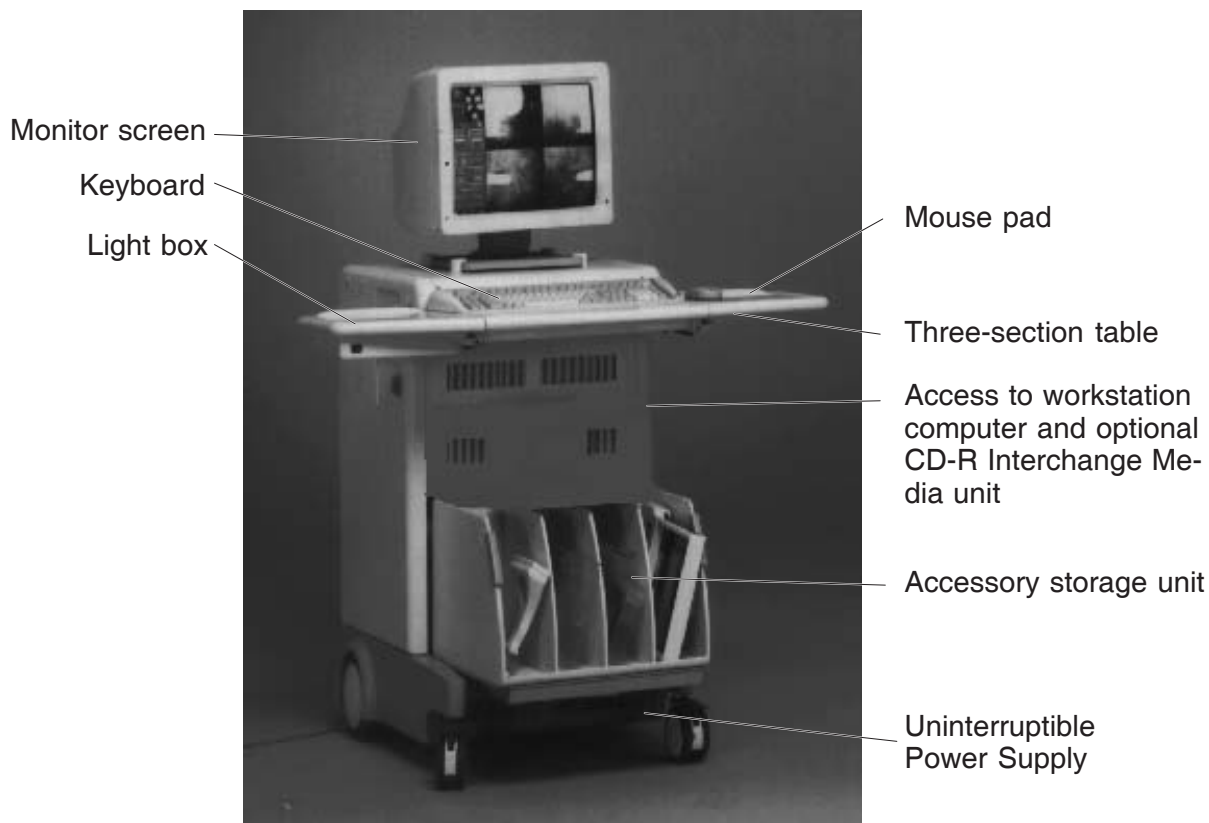
### 8-3 Digital Detector and Image Receptor

The Digital Detector is built into the Image Receptor, shown below. It is a flat panel of amorphous silicon on which cesium iodide is deposited to maximize detection of X-Rays and transmission of light photons. The high definition digital images produced are sent to the Acquisition Workstation for visualization and processing.

The upper surface of the Image Receptor is a removable grid (Bucky); when the grid is not required, it is easily removed and replaced by an optional breast holder without grid.



## 8-4 Acquisition Workstation Cart



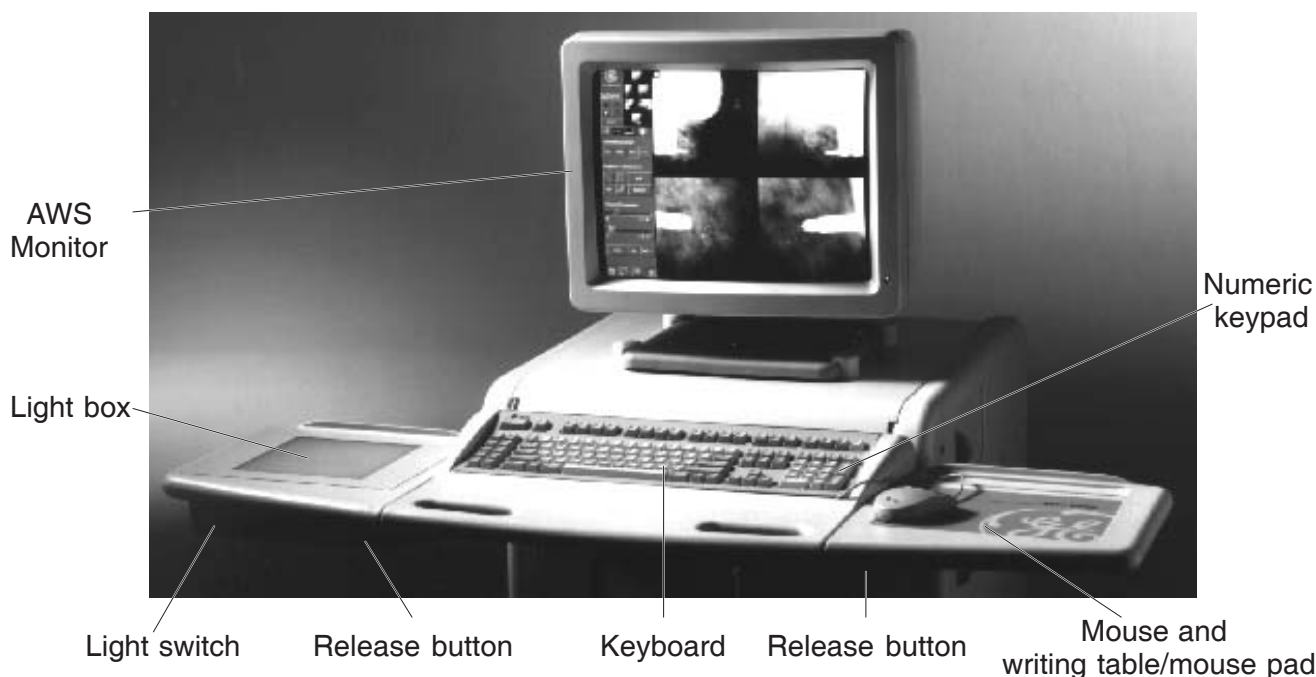
### 8-4-1 Overview

The Senographe 2000 D AWS (Acquisition Workstation) is used for image acquisition and display, database management, and to send images to archive, review or filming. Refer to Chapter 5 "Acquisition Workstation" for a detailed description of the workstation functions.

The workstation is installed in the AWS Cart shown above.

Inside the cart are housed the workstation electronics (AWS computer, IDC image detection controller), an accessory storage unit, the Uninterruptible Power Supply (UPS), and the optional CD-R unit for interchange purposes.

### 8-4-2 Three-Section Table



The three-section table consists of the workstation keyboard, light box and writing surface/mouse pad. It can be raised for easy access to the accessories which can be stored below the table.

The left and right sides of the table (light box and writing table/mousepad) can be lowered out of the way if necessary.

- To lower a side table, pull it slightly upwards, push the release button beneath it to release the lock, and lower it carefully (do NOT drop).
- To return a side table to its working position, lift it to the horizontal position, then pull it slightly upwards until the lock springs back into place.



**The three-section table is not designed to hold items in excess of 20 kg weight.**

### 8-4-3 Light Box

You can use the light box for viewing comparison mammograms.



**THE LIGHT BOX ON THE AWS CART MUST *NOT* BE USED FOR FINAL INTERPRETATION OF EXAMINATIONS. THE AMBIENT LIGHT CONDITIONS IN THE EXAMINATION ROOM, AND THE RESULTING LIGHT LEVEL OF THE LIGHT BOX, ARE INCOMPATIBLE WITH ITS USE FOR FINAL INTERPRETATIONS.**



**THE AWS MONITOR MUST *NOT* BE USED FOR FINAL INTERPRETATION OF EXAMINATIONS. IT IS SET UP FOR OPTIMUM VISUALIZATION WITH AN AMBIENT LIGHT LEVEL OF 50 LUX. LEAVING THE AWS LIGHT BOX ILLUMINATED WITHOUT A FILM IN PLACE MAY DEGRADE THE REVIEW QUALITY OF IMAGES DISPLAYED ON THE MONITOR.**

#### 8-4-4 Writing Table/Mouse Pad

The space to the right of the keyboard, with the integrated mouse pad, can be used for manipulating the mouse, and as a writing surface. There is a recess for holding pens and pencils.

**Note:** For the comfort of left handed users, the mouse can also be operated on any other horizontal surface of the three-section table. Your Field Engineer can position the mouse cable for optimum convenience for all users according to your requirements.

#### 8-4-5 Accessory Storage Unit

The Accessory Storage Unit is located inside the drawer at the bottom of the Senographe 2000 D cart. Open the drawer by depressing the small catch in the upper part of the opening. The unit is designed to store items removed from the Senographe 2000 D, or other accessories. Access to the compartments of the storage unit can be from the front of the cart, or the unit can be turned 90 degrees either way for access from the side. Ask your Field Engineer.

#### 8-4-6 Uninterruptible Power Supply (UPS)



UPS front panel

To assure system safety in the case of disturbances in the mains supply, the Senographe 2000 D system incorporates an Uninterruptible Power Supply (UPS), housed in the lower part of the Senographe 2000 D cart.

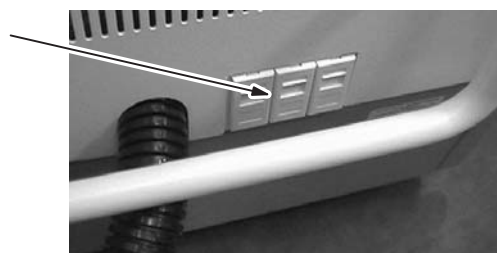
During power fluctuations or brief interruptions, the UPS assures a continuous supply to the workstation and the acquisition system, thereby preventing mains disturbances being transmitted to the system.

When a power failure occurs the UPS continues to supply power to the Workstation during the time needed for the workstation to shut down in an orderly manner.

#### 8-4-7 External Connections

Three connectors at the rear of the cart are used for external communications connections. From left to right, they are:

1. (Not currently used) Connection to local printer.
2. Modem connection to telephone network.
3. Ethernet connection to local network.



## 9. ACCESSORIES AND OPTIONS

### 9-1 Senographe 2000 D Accessories

The Senographe 2000 D is delivered with a set of breast compression paddles, including an axillary paddle, and a magnification platform. Accessories available as options include:

- Breast holder.
- Graduated biopsy compression paddle (for 2D localization) with optical localizer.
- Extra X-ray shield.
- X-ray remote control hand switch.
- Hydraulic chair.
- Quadruple foot switch (providing up/down control as well as compression control).
- Bar Code Scanner for automatic entry of patient information.

### 9-2 System Options

System options available include:

- **Review workstation.**
- **Mass archiving system.** When this option is installed and connected to the Senographe 2000 D, acquired images can be sent to the mass archiving device for permanent storage, either automatically or on request. A list of all patients ever imaged on the Senographe 2000 D system can be kept on the mass archiving device, making future retrievals fast and easy.
- **Laser Camera.** To provide “hard copies” of images, the Senographe 2000 D system can be connected to a high resolution DICOM MG compatible laser camera for film printing.

**WARNING**

**ONLY IMAGES PRODUCED BY GE-RECOMMENDED LASER CAMERAS CAN BE USED FOR FINAL INTERPRETATION OF EXAMINATIONS. FOR COMPATIBLE PRINTERS SEE THE LATEST PRODUCT DATA SHEETS FOR THIS SYSTEM, WHICH YOU BE OBTAINED FROM YOUR LOCAL GE SALES REPRESENTATIVE.**

- **Networking.** The Senographe 2000 D is DICOM compliant, allowing it to be connected in a network with other compliant devices for the exchange of images. Networking allows transmission of images acquired with the Senographe 2000 D system to other DICOM-compatible review stations, using the “Network Push” function of the AWS Browser. In some cases, detailed evaluations will be needed for the implementation of customized connections.
- **CD-R Interchange Media.** A CD-R (CD-Recordable) unit can be installed in the Senographe 2000 D cart, allowing selected sets of images to be saved on CD-ROMs for communication purposes (e.g., recording images for referring physicians, training, personal image library, etc.). It is NOT recommended for permanent archiving.

See your General Electric Medical Systems Representative for more information on accessories and options.

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## CHAPTER 3 – SENOGRAPHE 2000 D GANTRY

### 1. INTRODUCTION

The Senographe 2000 D Gantry is an X-ray system used for mammography examinations, which can be made with the patient in the standing or sitting position and for various views and magnification factors.

Major features of the Senographe 2000 D Gantry are the dual anode track x-ray tube, the entirely automatic AOP exposure mode, its ergonomic design, and of course its digital detector.

Operation of the Gantry is controlled from the Gantry Control Console, which also controls power to the Gantry and to the other components of the Senographe 2000 D system.

**Ergonomic design:** the Gantry is designed to ensure speed and convenience of patient positioning, as well as patient examination comfort.

#### Dual-Track x-ray tube:

- Each of the two anode tracks is composed of a different metal, allowing the best compromise between subject contrast and dose given to the patient.
- The rhodium (Rh) track provides improved penetration with a reduced radiation dose to the very dense breast. The molybdenum (Mo) track provides high quality mammography images in all other cases.
- Standard or magnification examinations can be performed with either track. Focal spot sizes are: 0.3 for contact exams and 0.15 for magnification exams.

#### AOP Mode:

- **The AOP (Automatic Optimization of Parameters) Mode** controls radiation. For a given priority (dose reduction, subject contrast or compromise of dose and contrast), the AOP Mode provides automatic selection of the optimum radiographic parameters (track, filter, kV, and mAs). A manually controlled mode is also available.



**Breast compression is essential when using the AOP mode. Refer to the Caution on use of compression in the AOP section of Chapter 10.**

#### Digital Detector:

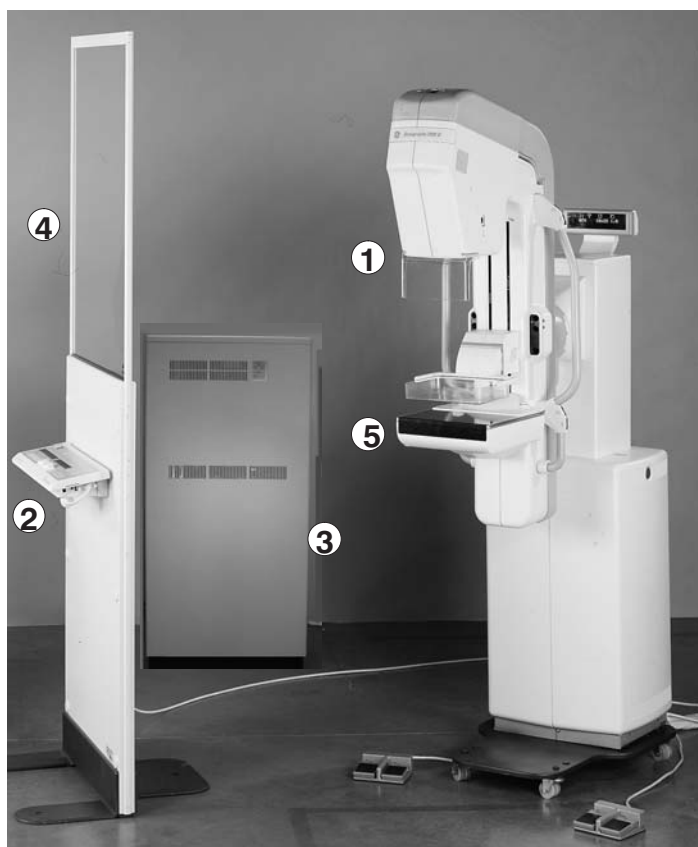
- The digital detector produces images by direct digitization. It contains a flat panel of amorphous silicon on which cesium iodide is deposited to maximize detection of X-Rays and transmission of light photons. The high definition digital images produced are sent to the acquisition workstation for visualization and processing.  
The detector is built into the Image Receptor, which functions as a breast support. This includes an easily removable Bucky, which can be interchanged with an optional Breast Holder (without grid).

## 2. COMPONENT OVERVIEW

The Senographe 2000 D Gantry includes the following components:

- ① X-ray system
- ② Control console
- ③ Generator Cabinet
- ④ Protective screen
- ⑤ Digital Detector

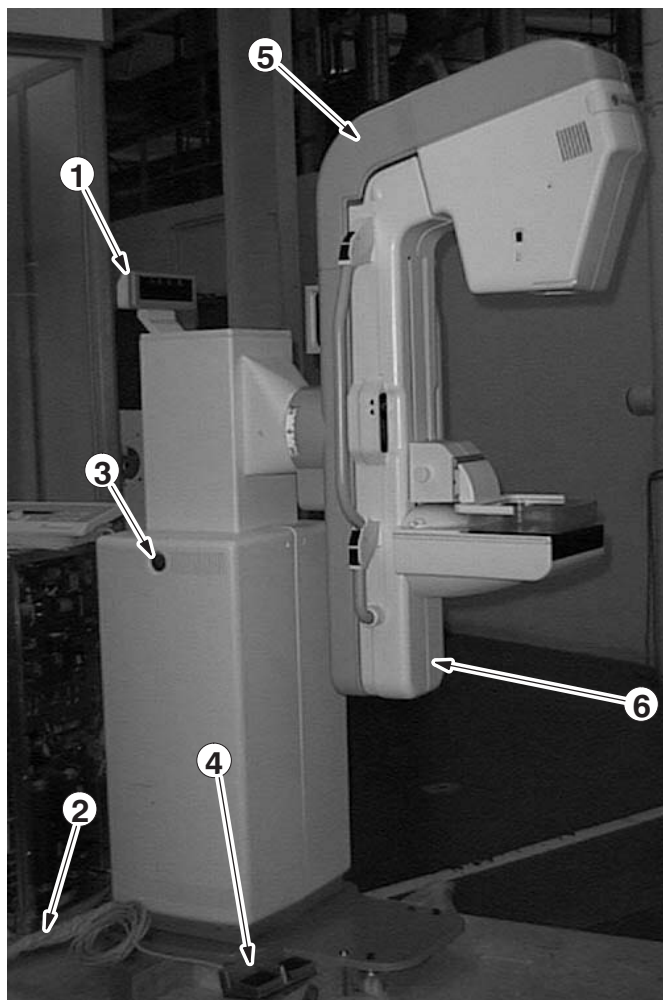
**Note:** Mandatory marking labels such as CE marking, UL Listing labels, and FDA labels are located on the bottom left hand side of the Generator Cabinet.



## 2-1 X-ray System

The X-ray system is equipped with a Telescopic Column which supports the Examination Arm.

The Telescopic Column must be secured to the floor using the fixed base plate.



- ① Readout.
- ② Connecting cables to generator.
- ③ Emergency Stop push-buttons (one on each side).
- ④ Compression/Decompression pedals; the four-pedal option also raises and lowers the Image Receptor.
- ⑤ Tube-arm Support.
- ⑥ Receptor-arm Support.

- **Readout:** The Readout display normally shows the following information (left to right):

Compressed breast thickness  
 Compression force  
 Field size  
 Magnification factor

When the Positioning Arm is rotated manually, the display shows the new angle for two seconds after the brake control button is released.

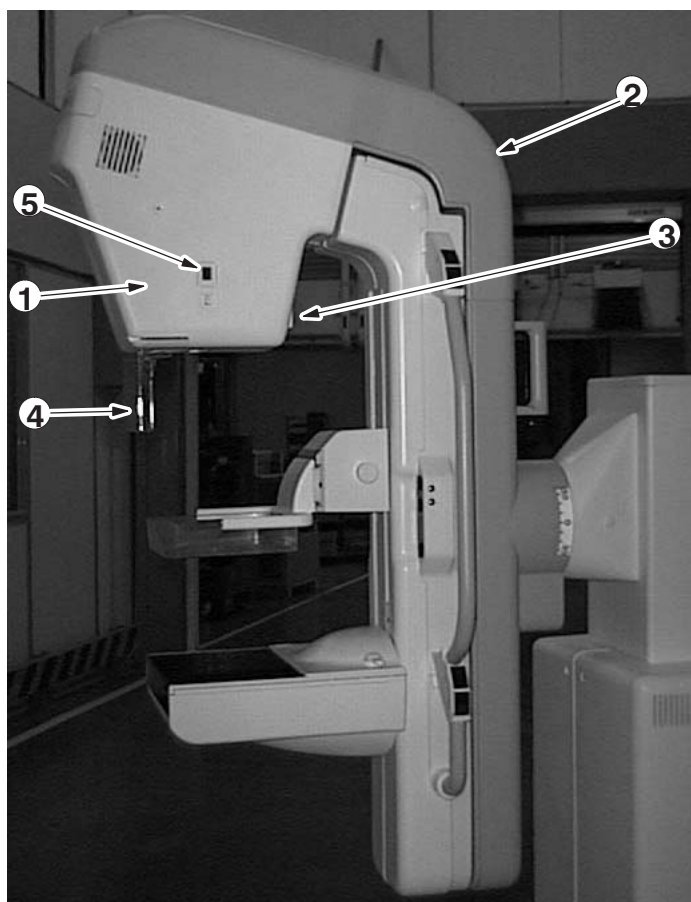
- **Positioning Arm:** This consists of two arms (the Tube-arm Support and the Receptor-arm Support), which are connected to the Telescopic Column by a common rotating shaft. The Positioning Arm can be rotated through 360 degrees (+180/-180 degrees) around this shaft.

**Note:** Do not attempt to use the handle at the rear of the arm to disengage and rotate the tube-arm support separately. The system will not allow exposures to be made with this arm disengaged.

- **Rotation Shaft:** This couples the Positioning Arm to the Telescopic Column. Silk-screened markings indicate the angles of rotation.
- **Telescopic Column:** This consists of two cylinders: a fixed cylinder and a telescoping cylinder, which elevates the Positioning Arm.
- **Emergency Stop:** There are two Emergency Stop push-buttons, one on each side of the Telescopic Column.

**Note:** If the Telescopic Column touches an obstacle during downward movement, the movement is stopped.

## 2-1-1 Tube-arm Support

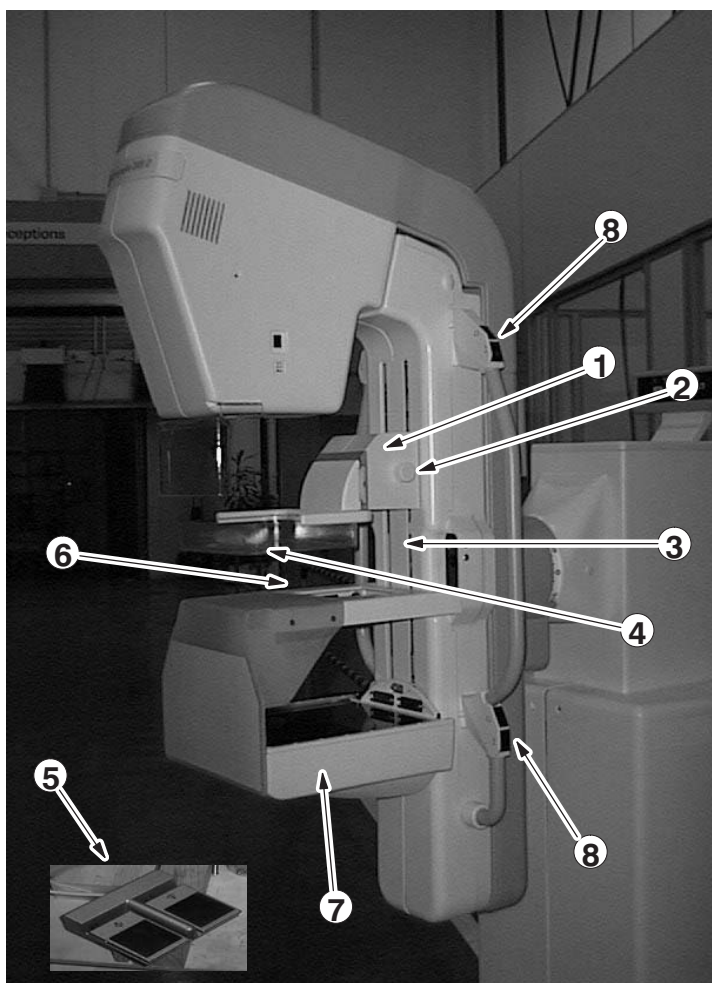


The main components of the Tube-arm Support are listed below:

- **X-ray Tube and Tube Housing Assembly** (2) An Up/Down (↑↓) control is located at the top of the assembly.
- **Collimator** (1) Contains the diaphragm and the light centering controls.
- **Diaphragm Control** (5) Two control buttons (one on each side of the collimator) are used to select the required format:  
Press either button once to select the last format used and to illuminate the centering light.  
Press the button again, as often as required, to toggle between the three formats:  

|                        |            |
|------------------------|------------|
| <b>Large format:</b>   | 19 x 23 cm |
| <b>Medium format:</b>  | 13 x 18 cm |
| <b>Reduced format:</b> | 9 x 9 cm.  |
- **Centering Light** (3) To illuminate the field coverage for 30 seconds, press the button located at the rear of the collimator.
- **Face protection** (4) This is mounted on the front of the X-ray Tube and Tube Housing Assembly. It can be easily removed.

## 2-1-2 Receptor-arm Support



The main components of the Receptor-arm Support are listed below:

- **Guide Rail (3) and Compression system** including magnification platform and compression paddle.
- **The compression system** comprises the paddle holder (1), the manual compression adjustment knobs (2), and the interchangeable compression paddle (4).

**Compression and decompression** are controlled manually or by the foot pedals (5) placed on the floor.

**Maximum compression force, speed of compression and decompression height** are programmed by the system SET-UP functions.

**Manual adjustments** to compression force can be made using the knobs (2), located on each side of the compression paddle arm. Turn the top of the knob towards the patient to *increase* compression, away from the patient to *decrease* compression.

**To change a compression paddle:** slide the paddle arm sideways from the compression paddle support.

**Note:** As a safety measure, the compression system is fitted with magnetic braking to avoid the paddle falling in the event of a power cut. If such a power cut occurs during an examination, a force of around 5 daN could remain on the compression paddle. To disengage the patient, raise the paddle steadily (do not try to lift it quickly) to counteract this compression force.

**Note:** Pressing a compression pedal or moving one of the thumbwheels illuminates the centering light.

- **The Magnification Platform** ⑥ is installed by latching the platform onto the Receptor-arm in the holes provided for the selected magnification (located on either side of the Receptor-arm). To unlock the magnification platform, press the lever located on the left of the platform and pull the platform forward (as shown on the label on top left side of platform). When the magnification platform is inserted the small focal spot is automatically selected, and the FOV is reduced to 9 x 9.

**Magnification factors** are defined in the middle of a 4 cm thick breast, i.e., 2 cm above the magnification platform. The useable magnification factors corresponding to each pair of holes, with an SID of 660 mm, are:

- Middle holes: 1.8
- Bottom holes: 1.5

**NOTICE**

**Do not use the upper holes for insertion of a magnification platform during patient examinations**

**NOTICE**

**Always make sure that the magnification platform is correctly locked in place before starting an exam.**

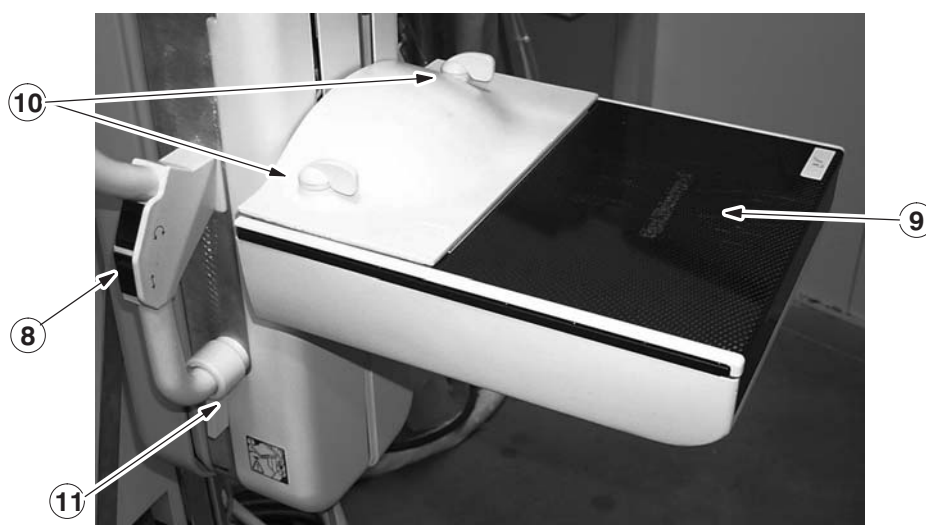
- **The Image Receptor** ⑦ functions as a breast support and includes a removable grid (see below).

### 2-1-3 Image Receptor

The Image Receptor contains the Digital Detector and associated components for image acquisition. Its upper surface supports the breast during examinations and is removeable. Two interchangeable units are available, one with grid (the Bucky), and one without (the optional Breast Holder). Note that exposures cannot be made with the Bucky and the Magnification Platform both present. It is possible, but not recommended, to make exposures with the Breast Holder and the Magnification Platform both present.



**Never make an examination without either the Bucky or the Breast Holder or the Magnification Platform fitted; the unprotected edge of the Digital Detector may damage sensitive skin when compression is applied.**



- The **Bucky** or the optional **Breast Holder** (9) slides into the top of the Image Receptor:

**Removal:** Turn the two release catch levers (10) towards you to release the Bucky or breast holder, then pull it out.

**Insertion:** Insert the Bucky or optional breast holder in the rails, then push it in until you hear a click.

- **Up/Down Control Buttons** (8) are located at the top and bottom of each handrail. Use these buttons to adjust the height of the Image Receptor by raising or lowering the Receptor-Support Arm. A protecting rim prevents patient access to the buttons. The height of the Image Receptor can also be adjusted by footswitches if the four-pedal option is present.

The height of the Image Receptor is adjustable between 761 mm (30 inches) and 1451 mm (57 inches); it can be rotated through 360° (+180° to -180°).

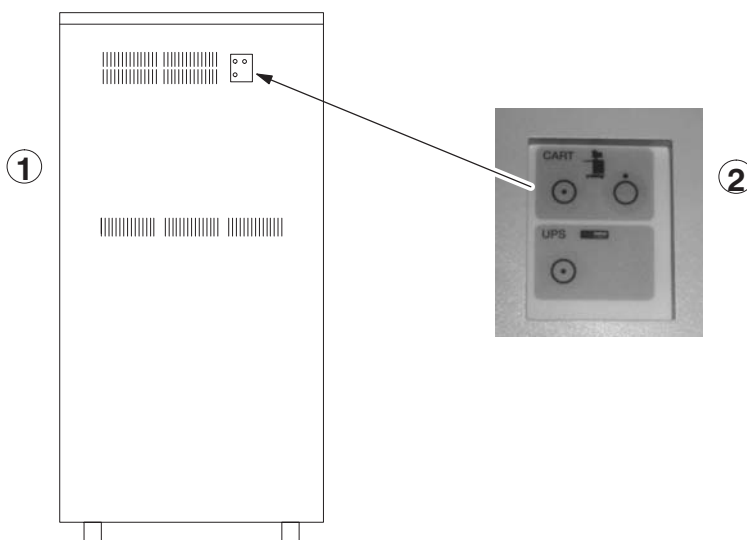
- The levers (11) which are used on the other Senographe systems to alter SID are not operational. The SID on Senographe 2000 D systems cannot be changed.



**Surfaces which contact the breast (e.g., Bucky, Breast Holder, and compression paddles) must always be kept clean; see Chapter 13.**

## 2-2 Generator Cabinet

The Generator Cabinet ① contains power switching equipment, the generator and system management electronics, and a chiller/dryer (connected to the Digital Detector for control of the detector environment).



- The cabinet is mounted on wheels for easy installation; it is not recommended that it be moved in normal operation.
- Do not obstruct the ventilation slots.
- The push-buttons ② visible on the cabinet supply power to the Cart and to the UPS. They are normally used only for Service operations.

## 2-3 Accessories

Accessories delivered with the basic configuration of the Senographe 2000 D Gantry include:

- Square spot compression paddle.
- Small round spot compression paddle.
- 19 x 23 cm compression paddle.
- Axillary compression paddle.
- Protective screen.
- Magnification platform.
- Face protection.
- Bucky with grid.

## 2-4 Optional Accessories

Optional accessories available for the Senographe 2000 D Gantry include:

- Optical localizer (consisting of cross hair and biopsy paddle) for two dimensional biopsy.
- Examination chair.
- Accessories storage unit.
- Remote handswitch.
- Breast Holder.
- Bar code scanner



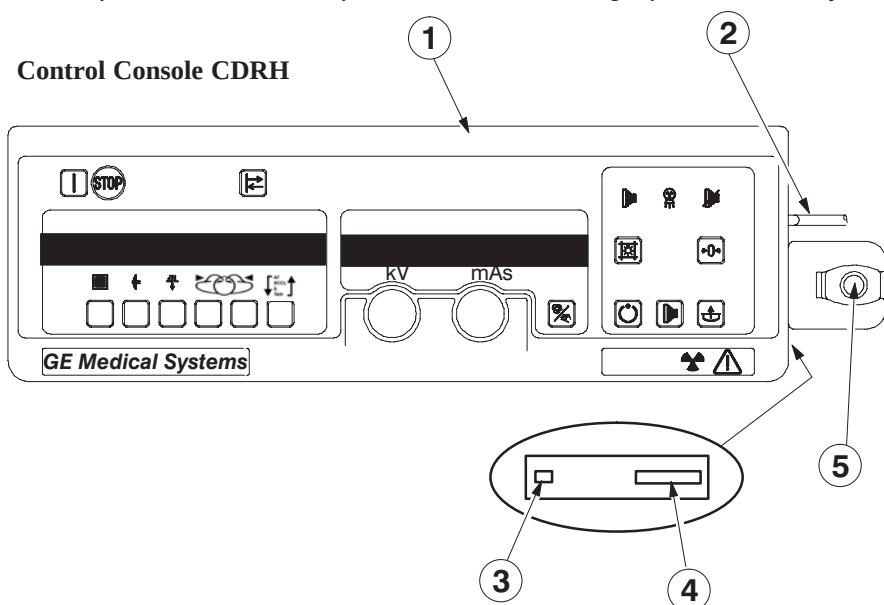
**Only Senographe 2000 D recommended accessories should be used with this equipment. Failure to heed this warning may cause unexpected functions and possible data loss.**

## CHAPTER 4 – GANTRY CONTROL CONSOLE

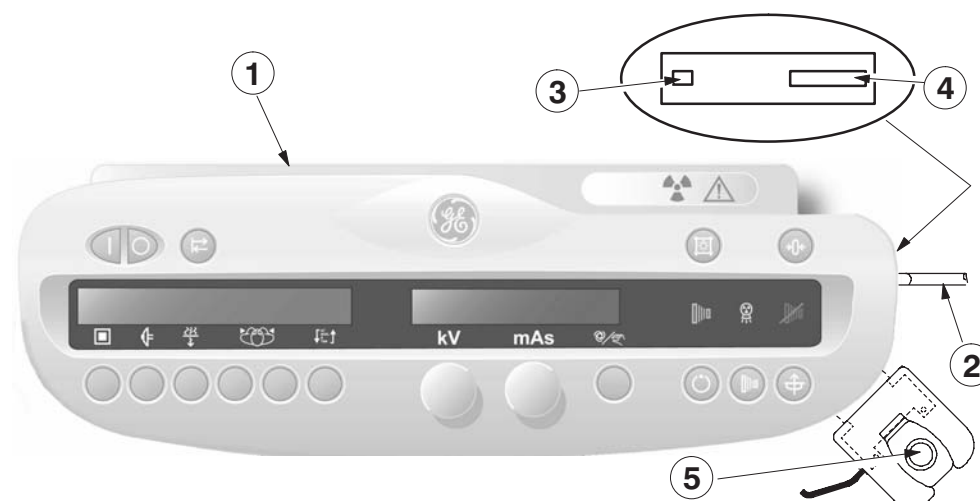
### 1. CONSOLE OVERVIEW

The Control Console is the interface between the Operator and the Senographe 2000 D Gantry. It provides three functions:

- Receives operator commands.
- Displays replies and/or machine messages.
- Controls power up/down for all components of the Senographe 2000 D system.



**Control Console 2001 (in forward production from February 2002)**



- 1 The Control Console can be placed on a suitable flat surface or installed on the protective lead screen.
- 2 Connecting cable to generator.

- ③ Plug for remote handswitch.
- ④ Plug for connecting cable to generator.

The following optional moveable accessory is available for the Console:

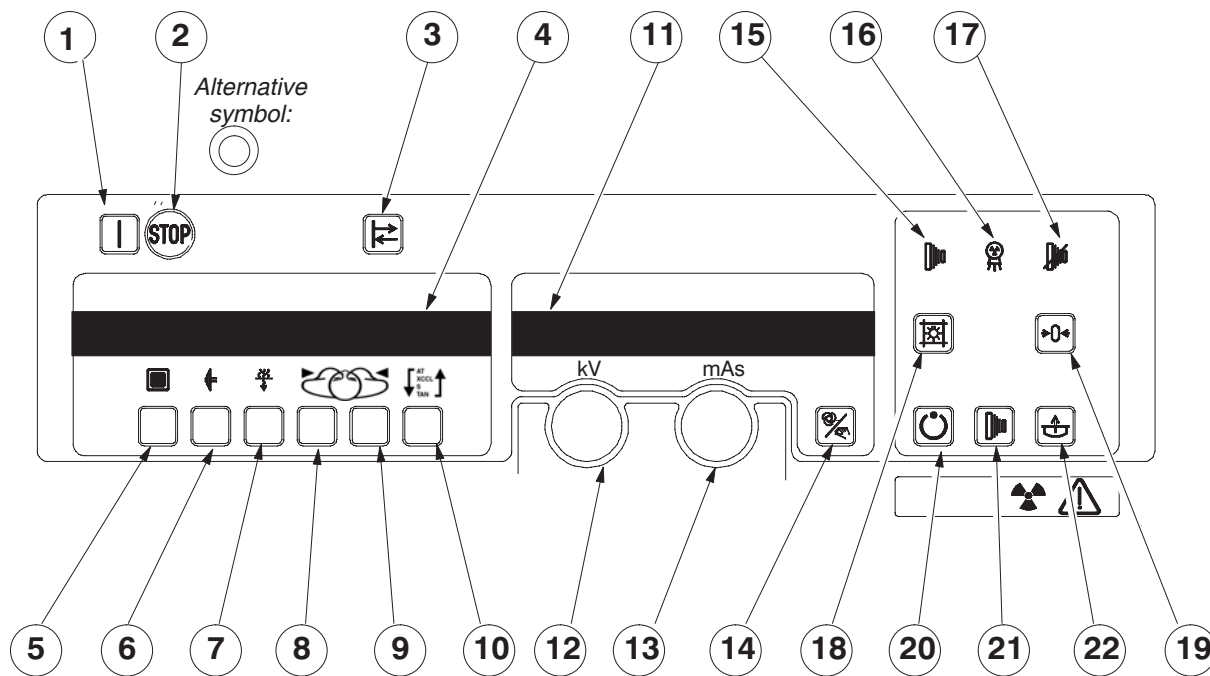
- ⑤ Remote Handswitch for Prep and Exposure.

For information on using the Control Console, refer to Section 3.

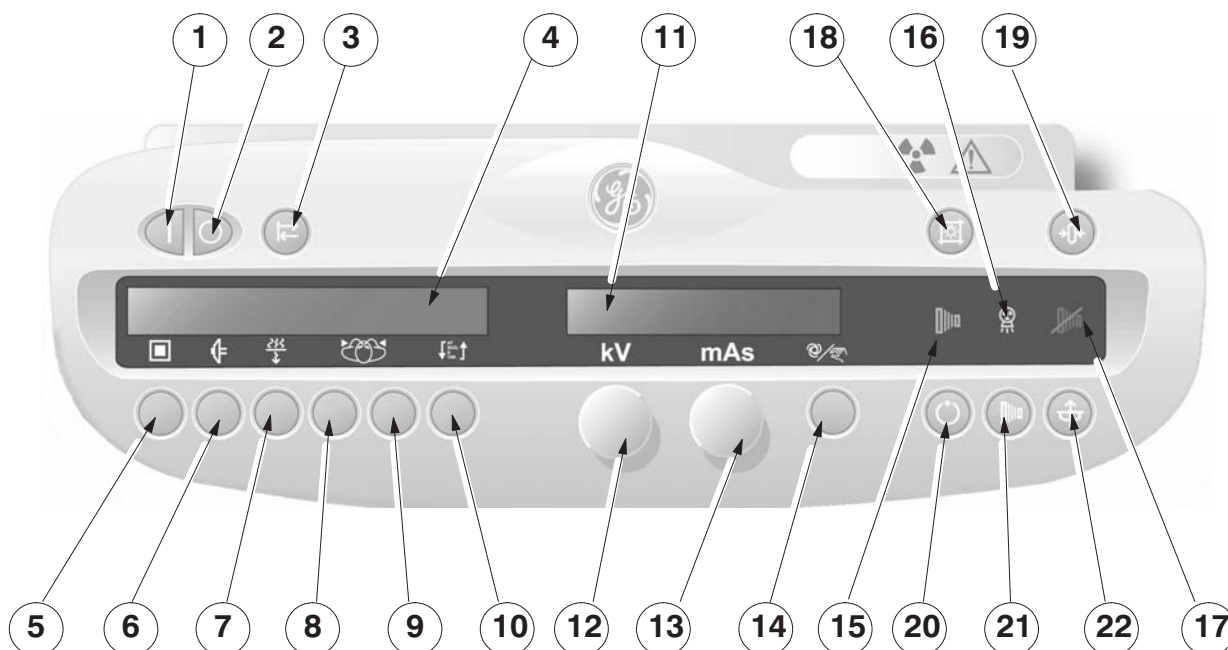
**Note:** The symbol  located on the control panel means that you must read the appropriate chapter in the operator manual before taking any action.

## 2. CONTROL CONSOLE OVERVIEW

Control Console CDRH



Control Console 2001 (in forward production from February 2002)

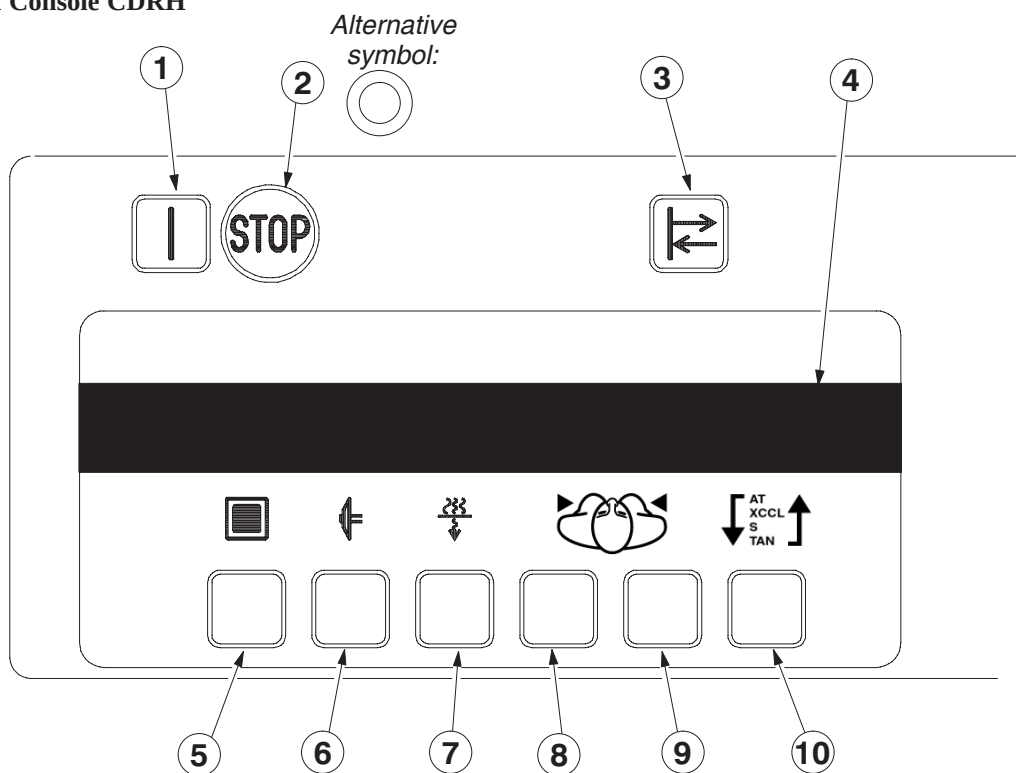


The Control Keyboard includes the following switches and displays:

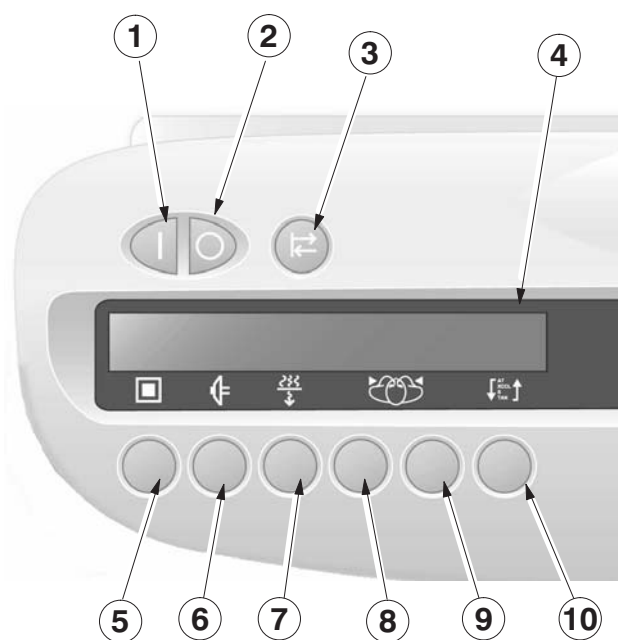
|    |                                                 |    |                                               |
|----|-------------------------------------------------|----|-----------------------------------------------|
| 1  | System power on switch <b>I</b>                 | 12 | kV selection                                  |
| 2  | Gantry power off switch <b>STOP</b> or <b>O</b> | 13 | mAs selection                                 |
| 3  | SETUP/MEDICAL Menu                              | 14 | AOP, Manual Mode selection                    |
| 4  | Readout                                         | 15 | Exposure Enable indicator lamp                |
| 5  | Focal Spot selection                            | 16 | Exposure indicator lamp                       |
| 6  | Focal Track selection                           | 17 | Exposure Disable indicator lamp               |
| 7  | Filter selection                                | 18 | Centering Light ON-button                     |
| 8  | Left Breast Selection                           | 19 | Exposure Interrupt indicator button and reset |
| 9  | Right Breast Selection                          | 20 | Prep                                          |
| 10 | Special Views selection                         | 21 | Exposure button                               |
| 11 | kV and mAs readout                              | 22 | Compression release Button                    |

### 3. LEFT-HAND SECTION OF CONTROL CONSOLE

Control Console CDRH



Control Console 2001 (in forward production from February 2002)



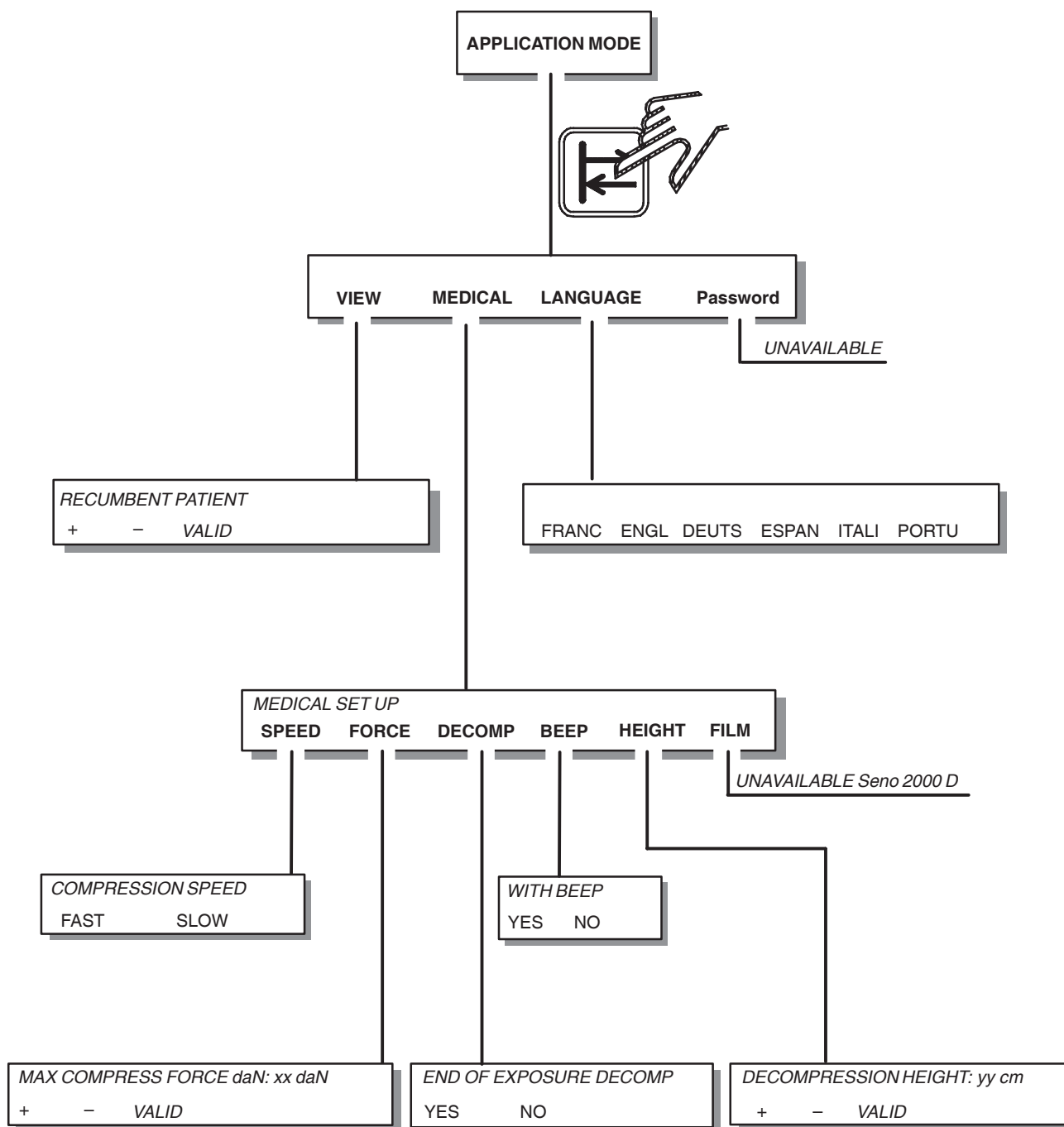
The left-hand section of the Control Console Keyboard is used to control system startup and shutdown, and to initialize or select generator parameters.

- ① **System power on switch I**  
Press the key to switch power to the Gantry and to the other system components; the indicator lamp lights and the system startup procedure begins. The Control Console displays the last configuration used.
- ② **Gantry power off switch STOP** or   
Press the key to power off the Gantry *only*; the indicator lamp lights.

**Note:** For more information on startup and shutdown procedures, refer to Chapter 6.

### 3 SET UP Menu

Press this key to access the Medical, Maintenance, and Installation menus.  
The Medical Menu is used to modify parameters, as shown:



xx, yy indicates that a single value is displayed or can be modified or entered.

**4 Readout**

The readout display comprises two 40-character lines.

- The upper line displays information, safety, and error messages.
- The lower line displays selected parameters: focal spot, focal track, filter, breast laterality, view names, presence of magnification, and angle

**5 Focal Spot selection**

Small and large focal spot selection.

**Note:** This selection is normally made automatically. By default, the system selects the large focal spot when a standard exam is selected, and the small focal spot when magnification is selected. The selection can be changed manually, but exposures are not possible when the automatic setting is overridden.

- Press the key to toggle between small or large focal spot (0.15 or 0.3, respectively).
- The readout indicates the size of the selected focal spot.

**6 Anode Track selection**

Press the key to switch between the two anode tracks, molybdenum (Mo) and rhodium (Rh).

- **In Manual mode**, press the key to select the anode track.  
The readout indicates the track selected.
- **In AOP (Automatic Optimization of Parameters) mode**, selection is automatic, and pressing the key has no effect.

**7 Filter selection**

Press the key to switch between the two filters, molybdenum (Mo) and rhodium (Rh).

- **In Manual mode**, press the key to select the filter.  
The readout indicates the filter selected.

**Note:** Certain filter/anode track pairs are inhibited according to the selected kV value. The system automatically selects an authorized filter and displays the selection.

- **In AOP mode**, filter selection is automatic, and pressing the key has no effect.

**8 9 Breast Laterality**

When acquiring an image, press the appropriate button to select the left or right breast..

Press the button **8** to indicate that a LEFT Breast is being imaged; or press the button **9** to indicate that a RIGHT Breast is being imaged.

**Note:** Selection of breast laterality (left or right breast) is mandatory. If laterality is not selected by the operator, the exposure command is disabled.

**10 Special Views selection (for standing or sitting patients)**

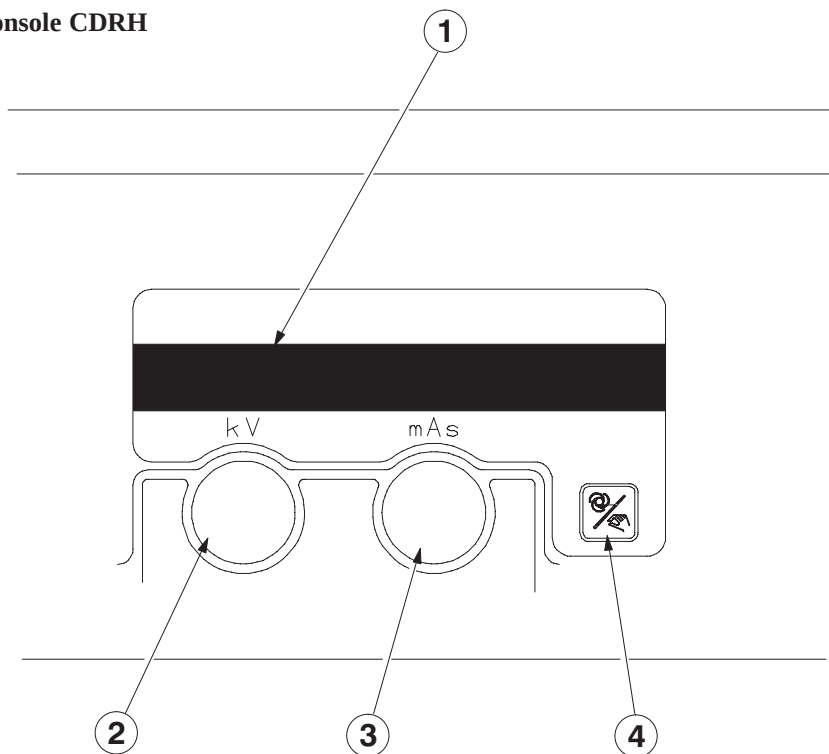
View names are normally determined automatically; the view names used are based on the ACR view name convention; see section 6 for more information. This key is used to modify the view name if a special view is used.

- Automatic view selection:  
After the operator selects breast laterality, the system determines and displays the correct view name according to the Gantry arm angle. View names selected automatically are:  
RCC, LCC, RMLO, LMLO, LSIO, RSIO, LML, RML, LLM, RLM, LLMO, RLMO, LFB, RFB.  
If magnification is in use, the letter M is automatically added to the view name after the laterality letter (e.g., LMCC for a mag view on the left breast in the CC position).
- Special view selection (for standing or sitting patients):  
When a special view is used which does not correspond to the automatic view selection, press the **Special Views Selection** key as often as required until the desired view name is displayed. Refer to Section 6 for details.
- Recumbent patients:  
The automatic and special view selection procedure applies only to standing or sitting patients. View names for recumbent patients (patients unable to stand or sit for the mammogram) are selected by using the **SETUP** key to access the **<RECUMBENT>** menu. See Section 6.

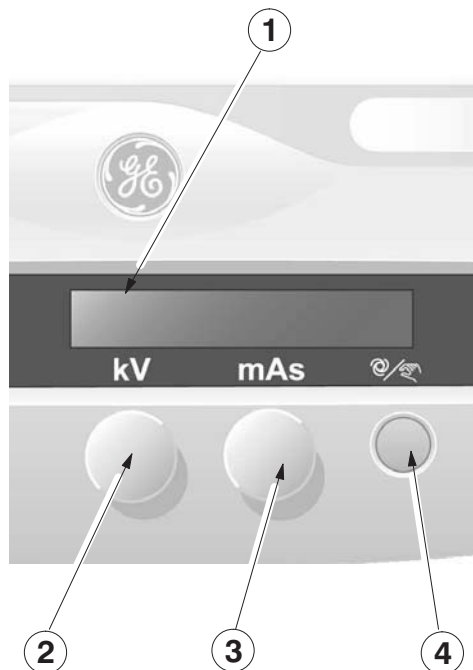
#### 4. CENTRAL SECTION OF CONTROL CONSOLE KEYBOARD

The central section of the Control Console Keyboard is used to select and display the kV and mAs values.

Control Console CDRH



Control Console 2001 (in forward production from February 2002)



## ① kV and mAs Readout

- **In manual mode** the readout displays the kV and mAs values selected by the operator.
- **When an AOP mode is selected**, the kV readout displays the code of the selected mode: CNT (Contrast), DOSE, or STD (Standard). The mAs readout displays AUTO.
- **At end of exposure**, the kV readout displays the kV values selected and the first letter of the code of the selected mode (C, D, or S); the mAs readout displays the mAs value.

## ② kV selection

- **In manual mode**, turn the kV knob to select the required kV value; the displayed value changes as the knob is turned. Available values are 22 kV through 49 kV in steps of 1 kV. There is no mechanical stop; you can continue to turn the knob past the minimum or maximum value (22 kV or 49 kV), but the displayed value no longer changes.
- **In AOP mode**, turning the knob has no effect.

## ③ mAs selection

- **In manual mode**, turn the mAs knob to select the required mAs value; the displayed value changes as the knob is turned. Available values are 4 mAs through 500 mAs, but some parameter selections may change these limits, e.g. the X-ray Console can display as high as 600 mAs whereas the exposure is automatically limited to 500 mAs. There is no mechanical stop; you can continue to turn the knob past the minimum or maximum value, but the displayed value no longer changes.
- **In AOP mode**, turning the knob has no effect.

## ④ AOP and Manual Mode selection

Press the key to step through the four possible modes; three AOP modes and Manual mode.

- **Three AOP modes** are available, according to the **priority** required:
  - CNT:** Contrast. Priority is given to optimum subject contrast.
  - STD:** Standard. Gives a compromise between good contrast and dose reduction.
  - DOSE:** Dose. Priority is given to dose reduction.

At the start of compression, the selected priority code is displayed on the kV readout. When the exposure is complete, the initial letter of the code selected is displayed on the kV readout.

- **Manual mode** is used to manually select kV and mAs values.

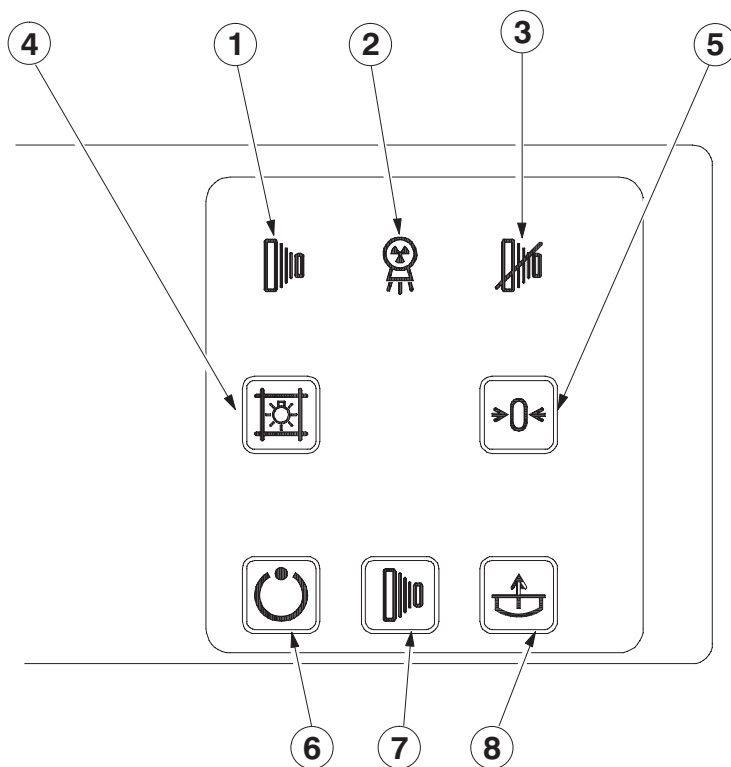


Breast compression is essential when using the AOP mode. Refer to the Caution on use of compression in the AOP section of Chapter 10.

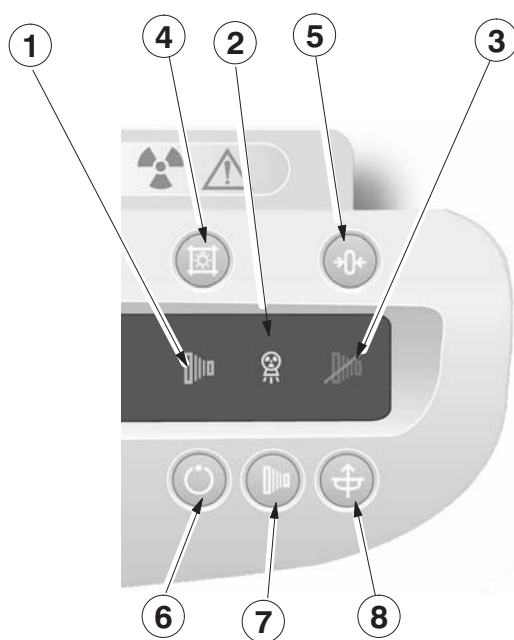
## 5. RIGHT-HAND SECTION OF CONTROL CONSOLE

This section is used to prepare and initiate an exposure, control the centering light, and for decompression and system reset.

Control Console CDRH



Control Console 2001 (in forward production from February 2002)



- ① **Exposure Enable lamp**
  - When lit, exposure is enabled.
- ② **Exposure indicator lamp**
  - Lamp is lit from start to end of exposure.
  - A buzzer sounds at the end of exposure.
- ③ **Exposure Disable lamp**
  - When this lamp is lit, exposure is disabled. Follow instructions displayed on readout on left section of Control Console.
- ④ **Centering Light ON button**
  - Press key to switch on the centering light for 30 seconds. The key lights. Note that the light does not function when an exposure is initialized.
- ⑤ **Exposure Interrupt button** (with indicator lamp).

When the exposure is terminated the lamp is lit and a buzzer sounds. Press the key to stop the buzzer and reset the system.
- ⑥ **Prep button** with indicator lamp.

Press the key to prepare the exposure (anode rotation).  
When the Exposure Enable lamp lights, exposure can be triggered.

**Note:** If the Prep button is released before the lamp is lit, the preparation is cancelled; preparation stops one second after release.

- ⑦ **Exposure button**

Press and hold this button while the Prep key is lit to make an exposure. To stop exposure immediately, release the key.  
A buzzer sounds at the end of exposure.

**Note:** In AOP mode and following preparation (anode rotation), exposure is made in two stages:

- An absorption measurement exposure of about 4 ms, which allows selection of the optimum kV, focal track, and filter combination for the chosen priority.

There is a short pause during which kV, focal track, and filter are set automatically.
- An exposure during which image acquisition is made.

**The operator must maintain pressure on the button until the buzzer stops to get proper exposure.**

- ⑧ **Compression release button**

Press to release compression. The compression paddle automatically moves up to the pre-programmed auto-decompression height.

**Note:** If auto-decompression is selected in the set-up menu, compression is released automatically at the end of the exposure.

## 6. VIEW NAME SELECTION

- View names (Projection Position Codes) used by the Senographe 2000 D system are described below in the section *View Names*.
- View names are normally selected automatically, according to the selected laterality, the presence or absence of the magnification platform, and the gantry angle, as described in the section *Automatic View Name Selection*.
- For views which do not correspond to the automatic selection, the operator must select additional information manually, as described below in the sections *Special Views Selection* and *View Names for Recumbent Patients*.

### 6-1 View Names

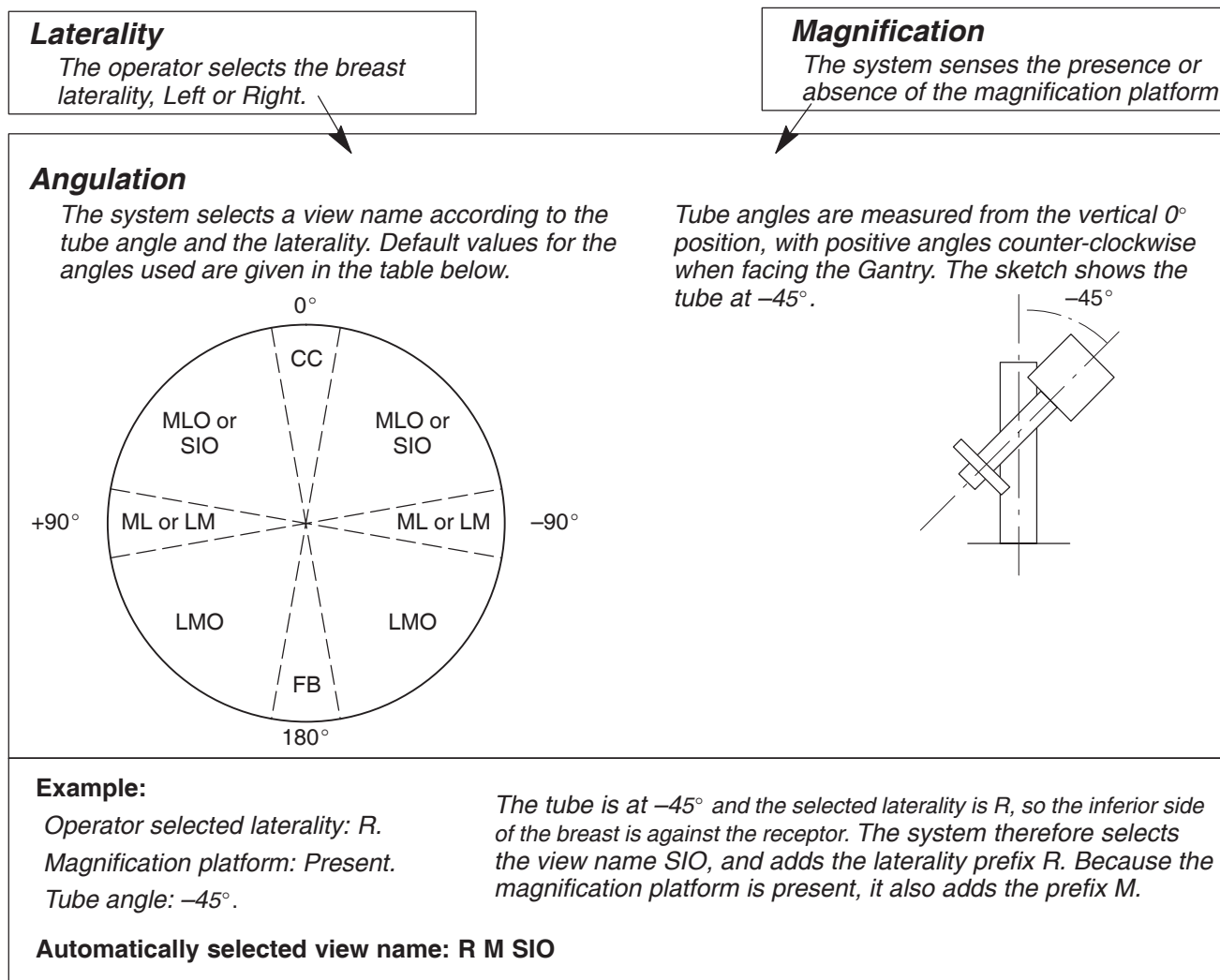
View names used by the Senographe system are shown here. They are based on the ACR (American College of Radiologists) standardized abbreviations for mammography projection position codes.

| Description                                                                                 | Code | Comment                                                       |
|---------------------------------------------------------------------------------------------|------|---------------------------------------------------------------|
| <b>Prefixes selected by operator (laterality):</b>                                          |      |                                                               |
| Right                                                                                       | R    | Laterality selected by operator                               |
| Left                                                                                        | L    | Laterality selected by operator                               |
| <b>Prefix selected automatically (magnification):</b>                                       |      |                                                               |
| Magnification                                                                               | M    | Selected automatically if the Mag. stand is present           |
| <b>View Names selected automatically (applicable only to standing or sitting patients):</b> |      |                                                               |
| CranioCaudal                                                                                | CC   | Inferior side of breast against receptor                      |
| MedioLateral Oblique                                                                        | MLO  | Inferior lateral side of breast against receptor              |
| MedioLateral (90°)                                                                          | ML   | Lateral side of breast against receptor                       |
| LateroMedial (90°)                                                                          | LM   | Medial side of breast against receptor                        |
| LateroMedial Oblique                                                                        | LMO  | Superior medial side of breast against receptor               |
| CranioCaudal (from below)                                                                   | FB   | Superior side of breast against receptor                      |
| Superolateral to Inferiormedial Oblique                                                     | SIO  | Inferior medial side of breast against receptor               |
| <b>View Names selected manually:</b>                                                        |      |                                                               |
| Exaggerated CranioCaudal                                                                    | XCCL | As CC with patient rotated laterally                          |
| Exaggerated CranioCaudal                                                                    | XCCM | As CC with patient rotated medially                           |
| Cleavage                                                                                    | CV   | As CC but inferior side of both breasts against receptor      |
| Axillary Tail                                                                               | AT   | As MLO; axillary breast medially and anteriorly onto receptor |
| <b>Suffixes selected manually</b>                                                           |      |                                                               |
| Implant Displaced                                                                           | ID   | Implant pushed back and flattened against chest wall          |
| Tangential                                                                                  | TAN  | Area of interest projected close to skin surface              |
| Spot Compression                                                                            | S    | Spot compression with or without magnification                |
| Roll Lateral                                                                                | RL   | Roll the breast slightly in lateral direction                 |
| Roll Medial                                                                                 | RM   | Roll the breast slightly in medial direction                  |

Prefixes and suffixes are used with the main view names; for example, RMMLO equals Right Magnified MedioLateral Oblique, and LCCRL equals Left CranioCaudal with upper breast tissue Rolled Laterally.

## 6-2 Automatic View Name Selection

### 6-2-1 The automatic view selection process



### 6-2-2 Angles used in automatic view selection; default values

| View Name Selected | Tube Head to Left |         | Tube Head to Right      |         |
|--------------------|-------------------|---------|-------------------------|---------|
|                    | Minimum           | Maximum | Minimum                 | Maximum |
| CC                 | -10°              | +10°    | Only one setting for CC |         |
| MLO or SIO         | +11°              | +79°    | -79°                    | -11°    |
| ML or LM           | +80°              | +100°   | -100°                   | -80°    |
| LMO                | +101°             | +169°   | -169°                   | -101°   |
| FB                 | +170°             | +180°   | -180°                   | -170°   |

Note that these values can be changed by the user:

### 6-3 Manual View Name Selection (Standing or Sitting Patients)

- If a special view is being used which does not correspond to one of the view names selected automatically, use the **Special Views Selection** key (key ⑩ in section 3) to modify the view name. Press the key as often as required until the correct modified name is displayed. There are two types of modifier:

*Modifiers which are added as a suffix:*

ID, TAN, RL, RM, S (e.g., RCC becomes RCCRM).

*Modifiers which replace the standard view names:*

XCCL, XCCM, or CV replace CC or FB.

AT replaces MLO.

#### NOTICE

When the patient is positioned for a Cleavage view (CV), external markers must be used to assist in determining laterality when viewing the image. Place a Right (R) or Left (L) marker in the lateral aspect of the breast of interest, or place markers on the lateral side of each breast. Markers must be placed outside of the 140 mm x 160 mm ROI used by AOP (see Chapter 10, section 4-1).

### 6-4 View Names for Recumbent Patients

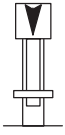
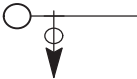
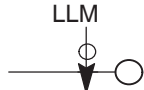
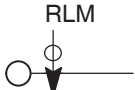
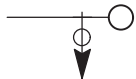
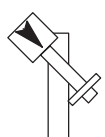
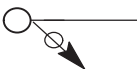
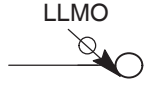
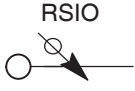
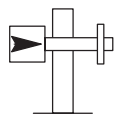
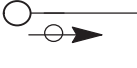
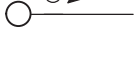
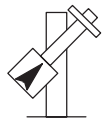
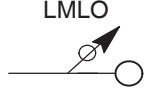
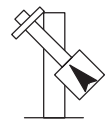
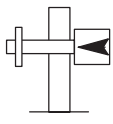
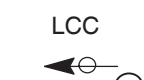
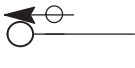
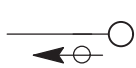
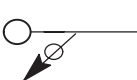
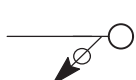
For patients unable to stand or sit for mammograms, the change of view imposed by the recumbent position means that the automatically selected view name is not correct. Follow the instructions below to change the view name

1. Position the tube to the desired angle.
  2. Select the laterality, L or R.
  3. Press the control console **SET UP** key (key ③ in section 3) once.
  4. Press **VIEW** to select the **RECUMBENT PATIENT** menu, overriding the automatically selected view name.
  5. Press the + or – key as often as required until the correct view name is displayed.
  6. Press **VALID** to select and save the displayed name.
  7. Press **SET UP** twice to return to the main menu and acquire the patient image.
- Repeat these steps for each view acquired on the recumbent patient.
  - The table given on the following page is intended as an aid in selecting appropriate view names for use with recumbent patients

Each row of the table starts with a sketch showing the tube position for one of the main tube angulations. It then gives, first for the Left breast, then for the Right breast:

- The view name corresponding to that angulation for a standing patient. This is the view name which is automatically selected and displayed by the system.
- A sketch showing the path of X-rays through the breast of a recumbent patient with her head to the left, with the corresponding view name. In the **RECUMBENT PATIENT** menu, press the – key as often as required until this view name is displayed.
- A sketch showing the path of X-rays through the breast of a recumbent patient with her head to the right, with the corresponding view name. In the **RECUMBENT PATIENT** menu, press the + key as often as required until this view name is displayed.

In each sketch the patient is shown from the rear.

| Tube Angulation                                                                     | Left Breast                   |                                                                                               |                                                                                             | Right Breast                  |                                                                                               |                                                                                               |
|-------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|                                                                                     | Automatic View Name Selection | Recumbent View                                                                                |                                                                                             | Automatic View Name Selection | Recumbent View                                                                                |                                                                                               |
|                                                                                     |                               | Head to Left                                                                                  | Head to Right                                                                               |                               | Head to Left                                                                                  | Head to Right                                                                                 |
|    | LCC                           | LML<br>      | LLM<br>    | RCC                           | RLM<br>    | RML<br>    |
|    | LSIO                          | LMLO<br>     | LLMO<br>   | RMLO                          | RSIO<br>   | RMLO<br>   |
|    | LML                           | LCC<br>      | LFB<br>    | RML                           | RCC<br>    | RFB<br>    |
|  | LLMO                          | LSIO<br>   | LMLO<br> | (RMLO)                        | RMLO<br> | RLMO<br> |
|  | LFB                           | LLM<br>    | LML<br>  | RFB                           | RML<br>  | RLM<br>  |
|  | (LMLO)                        | LLMO<br>   | LMLO<br> | RLMO                          | RMLO<br> | RSIO<br> |
|  | LML                           | LFB<br>    | LCC<br>  | RLM                           | RFB<br>  | RCC<br>  |
|  | LMLO                          | (LMLO)<br> | LSIO<br> | RSIO                          | RLMO<br> | RMLO<br> |

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## CHAPTER 5 – ACQUISITION WORKSTATION

### 1. OVERVIEW

#### 1-1 Introduction

The AWS (Acquisition Workstation) is housed in the AWS Cart. It has its own dedicated computer and image data base. It supports:

- Image acquisition from the Digital Detector
- Image display and manipulation
- Management of Patient information and the Exam Database
- Image transfer to other workstations using the DICOM standard
- Filming of images (on optional laser printer)
- Archiving images (on optional mass archiving system)
- Saving of images on recordable CD-ROMs (if the CD-R Interchange Media option is present)

Senographe 2000 D applications are based upon a graphical, multi-window, mouse-driven interface.

Images, lists, menus, and control panels are displayed within graphical windows on the Workstation monitor. Selections are made using buttons, menus and control panels, etc., by pointing and clicking with the mouse.



**Software programs other than those supplied by General Electric Medical Systems specifically for use with this system must NOT be loaded onto the system.**



**The AWS Cart is mounted on wheels so that it can be easily positioned for maximum convenience in the examination room. It should NOT be considered a “mobile” unit. Take great care if you must move it in the vicinity of any person or equipment. Do not move it during an examination.**

## 2. WORKSTATION UNIT



The Senographe 2000 D Acquisition Workstation features:

- A computer unit (with internal hard disk unit for system software and image storage), housed inside the Senographe 2000 D AWS Cart
- A monitor, located on top of the cart
- An alphanumeric keyboard, and a mouse and pad, integrated in the three-section table at the front of the cart.

The computer desktop unit is equipped with an internal 3-1/2" floppy disk drive and an internal CD-ROM drive.

**Note:** The internal CD-ROM drive is for GE Service use only (for updating or installing software). It is not able to read image files from systems equipped with the CD-R (CD Recording) Interchange Media option.



The monitor should be used in a suitably dark environment when reviewing a digital image. The optimum ambient light level is 50 lux.



THE AWS MONITOR MUST *NOT* BE USED FOR FINAL INTERPRETATION OF EXAMINATIONS. IT IS SET UP FOR OPTIMUM VISUALIZATION WITH AN AMBIENT LIGHT LEVEL OF 50 LUX. LEAVING THE AWS LIGHT BOX ILLUMINATED WITHOUT A FILM IN PLACE MAY DEGRADE THE REVIEW QUALITY OF IMAGES DISPLAYED ON THE MONITOR.

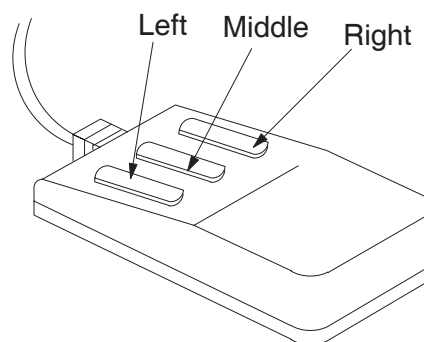
## 3. STARTUP AND SHUTDOWN

- Refer to Chapter 6 for power up and power down procedures.

## 4. HARDWARE CONTROLS

### 4-1 Mouse

The mouse is a hand-operated device which is maneuvered across the surface of a pad. The on-screen cursor mimics the movement of the mouse, allowing movement among windows and menus. For instance, moving the mouse to the right causes the cursor to move to the right, and so on.



The left mouse button is used to select functions and items.

The middle and right mouse buttons are used for specific functions, described in the appropriate sections of this manual.

“**Click**” means to press and release a button without moving the cursor.

“**Double-click**” means to click a button twice in rapid succession.

“**Press and drag**” means to move an item across the screen. With the cursor on the item, press and hold the appropriate button while moving the mouse across the pad, “dragging” the selected item.

“**Drag and drop**” means to drag an item and “drop” it in a new location. Drag the item as described above (“press and drag”), then drop it in the required position by releasing the button. Specific “drag and drop” operations are described in more detail in the appropriate sections of this manual.

**Important:** “Clicking the mouse button”, “pressing a button”, “selecting a menu item”, etc. in this manual always refer to using the left mouse button, unless the middle or right mouse button is specifically mentioned.

### 4-2 Keyboard

The keyboard is used for entering text at on-screen prompts and alphanumeric data in data entry fields.

Use the Delete or Back Space key to erase entered text or data.

The use of the Shift and Control keys is described in the appropriate sections of this manual.

**Note:** **The Front key.** The workstation can run more than one application at the same time (e.g., the Browser application can run in the background while an exam is being acquired). The active screen is in the foreground, hiding the others. The Front key on the keyboard is used to bring running applications to the front. If several programs are running, press it as often as necessary to bring the desired screen to the front.

## 5. WINDOWS

There are several types of windows that will be encountered as you use the Senographe 2000 D Acquisition Workstation.

The most important ones are:

- The Browser is the main window used to manage the database, start the Review application, etc. See Chapter 7 *Browser*.
- The Worklist is used to display a list of scheduled operations. From this window you can start image acquisition and review operations. See Chapter 8 *Worklist*.
- The Viewer is used by the acquisition and review applications to display and process the images. See Chapter 9 *Viewer*.

These main windows give access to other windows, such as the Medical Procedure Card window, the Annotations window in the Viewer, various user selection windows, etc.

Also, small message windows concerning procedures in progress appear on your monitor as you perform various functions. Some of these disappear on their own, others remain on the screen and the application remains blocked until the message is acknowledged by clicking on **(OK)** or **(Cancel)**.

**Note:** If the system does not respond because two or more windows are open one on top of another, it is possible to recover by pressing the Front key on the keyboard (several times if needed) to access hidden windows.

## 6. ON-SCREEN TOOLS

### 6-1 Cursor



The cursor is the on-screen tool which you maneuver across the screen using the mouse, to display pull-down menus, make function selections, and manipulate lists, images, and windows.

The cursor changes shape or orientation to indicate a change in function. Some examples:



- When you click on a menu item to open a pull-down menu, the cursor changes to an arrow pointing to the right, to indicate you can now make a selection in the pull-down menu.



- The cursor changes into a watchface if a function that you have selected takes more than a moment to implement; no further function selection is available until the procedure is completed. Once the procedure is finished, the cursor returns to an arrow shape, indicating that the workstation is ready to accept further input.

## 6-2 Buttons



Most windows contain buttons to activate specific functions. These functions are described in detail elsewhere in this manual.

To select (or activate) a button, click on it.

When a button's label is shaded grey rather than white, it means that the button's function is currently not available.

## 6-3 Menus

Certain buttons activate specific functions directly. Others activate drop-down menus that allow you a choice of functions.

To select (or activate) a function in a menu, move the cursor onto the menu item and click. The workstation carries out your command, and the menu disappears.

When a menu item is shaded grey rather than white, it means that the function is currently not available.

## 6-4 Scroll Bar

A **scroll bar** is an on-screen tool that you use to page through data that cannot be fully displayed at once on the screen or in a particular window, such as lists of patients or exams in the Browser.



To move through the data controlled by the scroll bar (images, items in a Browser list, etc.), you can place the cursor on the vertical rectangular bar within the scroll bar.

Then, press and hold the left mouse button, and drag the cursor up or down to move backward or forward through the list. The vertical bar within the scroll bar shows you where you are within the list compared to the list as a whole.

Release the mouse button when the desired data are displayed.



Or, if you want to move through the data one item at a time, place the cursor on either the upper or lower arrow and click the left mouse button. Each click moves you up or down by one item of the data.



If you want to move through the data one page at a time, place the cursor either above or below the vertical bar and click the left mouse button. Each click now moves you up or down by one page of data.

A **scroll bar** becomes active only if the display capacity of the list is exceeded. Otherwise, the vertical bar fills the full height of the scroll bar and clicking on the vertical bar or the arrows has no effect.

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## CHAPTER 6 – START UP AND SHUTDOWN

### 1. START UP PROCEDURE

To power up the system, press the power switch **I** on the Control Console. Power is applied to the whole system (Gantry, Cart, Digital Detector, etc.); green power indicators are lit on the Generator, the Cart, and the monitor.

A series of system initialization messages appears on the Workstation screen, then the Login: prompt is displayed. Type **sd** (all lower case) followed by **<Enter>**. When the password prompt appears, type **adw3.1<Enter>**. The AWS Browser is displayed after a short delay.

### 2. SYSTEM SHUTDOWN

To power down the system, click the System Shutdown button  on the AWS Browser window. A confirmation message is displayed asking if the entire system should be shut down, If the response is **Yes**, power is removed from the Senographe 2000 D Gantry and other system components, while the Acquisition Workstation begins a controlled shutdown, designed to safeguard data. Complete system and UPS shut down takes about two minutes from switch-off.

#### NOTICE

The Acquisition Workstation follows an automatic shut down procedure which protects image and patient data. No prompts are displayed. Do not disturb this procedure by attempting to enter commands at this time.



NEVER switch off at the UPS (Uninterruptible Power Supply) except in emergency (risk of data loss).

### 3. EMERGENCY SHUTDOWN

- **In an emergency, to cut power to the Gantry:** Press one of the Emergency Stop push-buttons; there is one on each side of the Telescopic Column.
- **In an emergency, to cut power to all system components:** Switch off the main circuit breaker that supplies power from the hospital system to the Senographe 2000 D system. All image and patient information being processed at the time is lost, and the Conditioner which controls the Digital Detector environment is switched off.

### 4. GANTRY RESET

Certain configuration operations require the Gantry to be switched off and restarted. It is usually desirable to reset the Gantry without disturbing the operation of the Acquisition Workstation.

To do this, switch off the Gantry and Generator by pressing the Control Console power switch **STOP** or . Switch them on again by pressing the power switch **I**.

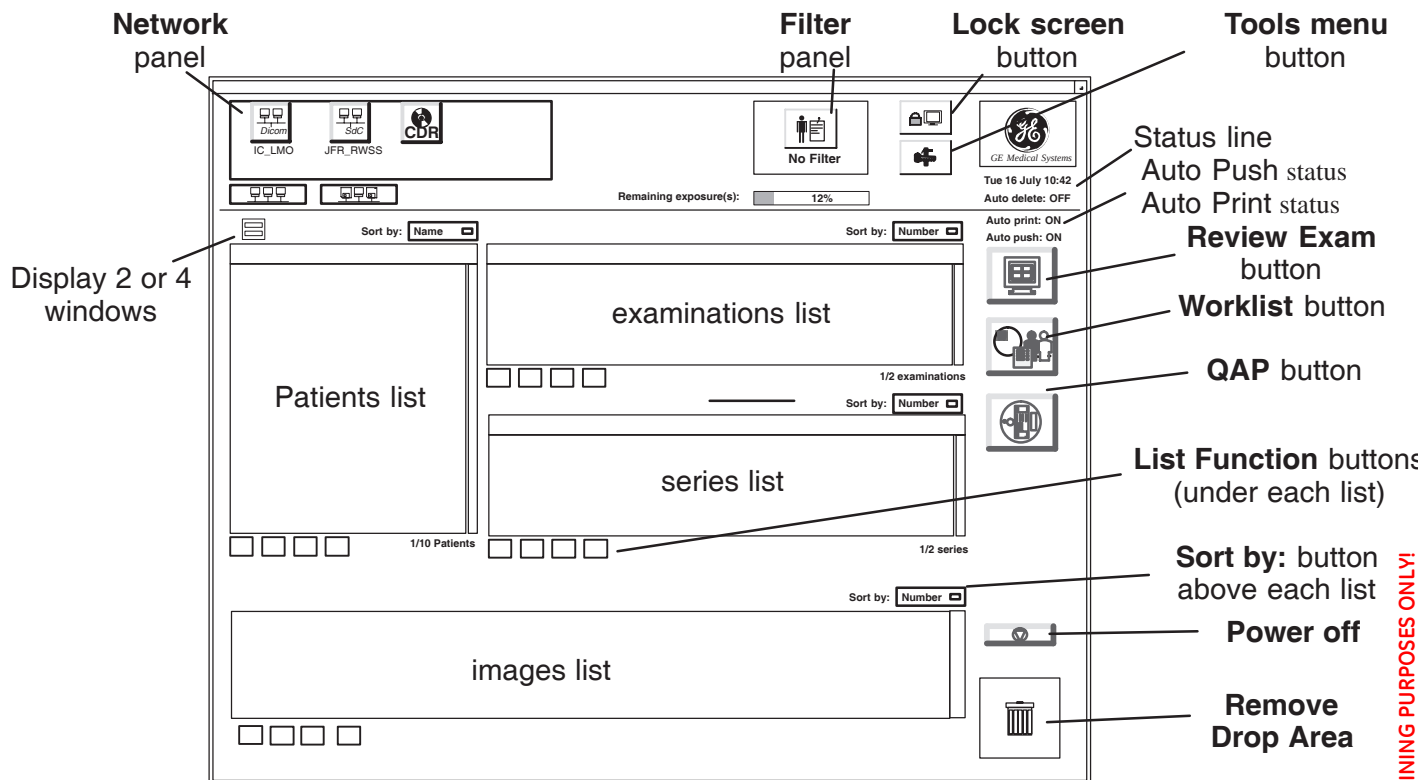
### 5. GENERATOR CABINET PUSH-BUTTONS

Push-buttons mounted on the Generator cabinet control power to the **AWS Cart** and to the **UPS**. They are provided for service and emergency use; they should not be used in normal operation.

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## CHAPTER 7 – BROWSER

### 1. OVERVIEW



The Browser window illustrated above (usually simply called “the Browser”) is displayed when the Senographe 2000 D system is first switched on. Note that the Tools menu function (section 9) allows a number of Browser display options, so the windows and icons displayed may differ from that shown here.

The Browser is used to:

- Shut down the Senographe 2000 D system.
- Link with the HIS/RIS (Hospital/Radiology Information System).
- Access to the Worklist for setting up and starting patient examinations.
- Select images in the workstation database for review.
- Manage the database (in particular to remove images that are no longer required).
- Transfer images to the Review Workstation or to other workstations.
- Save images on recordable CDs for data interchange (if the CD writer option is present).
- Archive images (if the optional mass archiving system is present).

## 2. BROWSER RESTART

If it is necessary to restart (reset) the Browser, proceed as follows:

- Place the cursor in the title bar at the top of the Browser window.
- Use the left mouse button to drag the window down, leaving a blank space on the screen above the window.
- Place the cursor in the blank space; click the right button.
- Select **(Restart Browser)** from the drop-down menu.



If Network, Printing, or Save operations are in progress, a warning box is displayed, allowing you to proceed with the restart or to cancel it; the jobs in progress are interrupted and may be lost when the Browser is restarted. Network transfers are stopped, but are automatically retried after the restart. Printing and save operations are stopped, and must be launched again after the restart. Note that interrupted save operations to a CD-R may result in a partially saved file on the disk; the disk will be unuseable and must be replaced before the operation is repeated.

## 3. SYSTEM SHUTDOWN



- To shut down the Senographe 2000 D system, click on the **Power off** icon at the lower right of the Browser window. Power is removed from the Senographe 2000 D Gantry and Generator; the AWS system follows a shutdown procedure lasting about two minutes, designed to ensure that no information is lost.

## 4. LOCK SCREEN



- This function may be used, for example, to prevent others from using the system when a Physicist is carrying out tests and must leave them temporarily unfinished.
- To lock the browser screen in its current state, preventing others from using it, click the **Lock screen** icon at the top right of the screen.
- To unlock the screen, press the Return key, then enter the password when requested (refer to the start up procedure given in Chapter 6).

## 5. BROWSER DISPLAY

### 5-1 Lists

The Browser contains lists showing the patients, examinations, series, and images presently on the image disk:

- **Patients list:** patients for whom examinations are stored on the image disk,
- **Examinations list:** examination for the selected patient  
Note: examinations are sometimes referred to as studies.
- **Series list:** the different series of images within the selected examination; Raw, Processed, and Screen Save images.
- **Images list:** images within the selected series.

The number of items (patients, examinations, series, or images) currently selected, and the total number of items contained in the list, is displayed at the lower right corner of each list.

In addition to raw and processed images acquired locally by the Acquisition Workstation, the browser lists may also include SCPT (Secondary Capture) images.

### 5-2 List format

The Browser displays lists of patients, exams, etc., in two formats:



– **Two-list format:** Patients and examinations.



– **Four-list format:** Patients, examinations, Series, and Images.

To change from one format to the other, click the appropriate small icon just above the Patient list.

### 5-3 Application Controls

The Application control buttons to the right of the Browser lists are used to review images stored on the workstation database, to start Quality Assurance Procedures (QAP), to input patient demographics from the HIS/RIS, or to send a message to the local GE Service Center.



- To review images stored on the workstation: select the desired images on the Browser, then click on the **(Review Exam)** button.

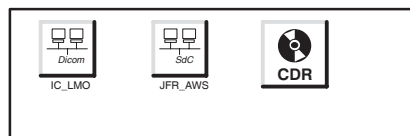


- To link with the HIS/RIS and access the Worklist management function: click on the **(Worklist)** button.



- To start Quality Assurance Procedures: click on the **(QAP)** button; select the required procedure from the list presented.

## 5-4 Network Panel



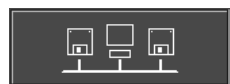
The **Network** panel at the top of the Browser displays (in the form of icons) the remote hosts and storage devices (such as CD-R) currently connected to your workstation. See section 7 for more information.

## 5-5 Status display

Icons and text on the Browser Status line give status information. Not all icons are present at any one time, depending on the installed options and current operations. Possible status indications are, from left to right of the screen:



- Network status. A dot moving along the lower line indicates that a network transfer is in progress,



- Media transfer status. A dot moving along the lower line indicates that a media restore operation (e.g., from CD-ROM) is in progress,



- Database query. If present, indicates that a query is in progress (local hard disk access). This icon may appear only very briefly. Any error messages that may result from a database query are also displayed in this position.



- Filter indicator. If present, indicates that a filter is currently applied (see section 9) . Click on the indicator to display the current local filter window.
- Current date and time, and Auto Delete status. Shown in text form just below the GE logo at the right of the screen. The status of the *Auto Print*, *Auto Push*, and *Auto Delete* options is also shown (ON or OFF). Auto-delete should normally be OFF.
- Disk space available is shown as the number of *Remaining exposures*. Note that each exposure includes two images (raw and processed).

## 6. BROWSER MANAGEMENT

### 6-1 Selecting Images



If more items are present in a list than can be displayed at one time, use the scroll bar on the right of the list to move through the items in the list (see Chapter 5 “Acquisition Workstation”, for information on how to use the scroll bar).



An arrow button beneath a list indicates that more columns of information may be available; click on the button to view the additional information.

### 6-2 Selecting Images

To work with the images stored on the Workstation database (image review, network transfer, etc.), first *select* the desired images on the Browser. Select in turn the desired patient, study, and series, by clicking on them. Each selected item is highlighted.

If any image of an examination is selected, all images of the series will be loaded and displayed.

To select a number of specific images, hold down the Ctrl key on the keyboard, and click on each of the desired images. To select a range of images, click on the first one in the range, then hold down the Shift key and click the last one in the range.

### 6-3 Status of Series

The Status column in the Series list is used for single letter flags which indicate the status of the series:

|   |                                                                                                                                                 |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------|
| A | Archived (storage commitment received from a mass archive system).                                                                              |
| C | Copied onto CD-R media.                                                                                                                         |
| P | Sent to a printer (this does not guarantee that the image(s) have been printed).                                                                |
| S | Sent to a network entity.                                                                                                                       |
| L | Locked      Click on the Lock button  to lock an item.       |
| U | Unlocked      Click on the Unlock button  to unlock an item. |
| * | In use (being reviewed, archived, or transferred).<br>Images from in-use studies cannot be removed.                                             |

## 6-4 Sorting Lists

To sort the items in the lists according to different criteria:

- Sort by:  • Click on the **(Sort by:)** button above the list you want to sort, then select the desired sorting option in the drop-down menu.
- **Patient lists** can be sorted by: Identifier, Name, Last study date.
  - **Exam lists** can be sorted by: Date, Identifier, Description, Performing physician, Referring physician.
  - **Series lists** can be sorted by: Number, Type, Identifier, Name, Last study date.
  - **Image lists** can be sorted by: Number, Old–new date, New–old date.

## 6-5 Deleting Images

To delete patients, examinations, series, or images from the image disk of the workstation:



- Select the items you want to delete in the corresponding list, then click on the **(Delete)** button under that list (if the button is not displayed, it can be turned on using the Tools menu).
- **OR** Drag the selected item using the middle mouse button, and drop it on the large **(Delete)** icon at the bottom right hand corner of the screen.

A message window pops up asking you to confirm the delete operation. Click on **(OK)** to confirm, or click on **(Cancel)** to cancel the operation.

If a **(Delete)** button is displayed in grey, this indicates that the selected item is currently in use by an application (Viewer or network transfer), and therefore cannot be deleted.

- If the mass storage option is present, an **Auto Delete** function can be set. This automatically deletes items from the local database when they have been committed by the storage device. The function must be activated by GE Service.

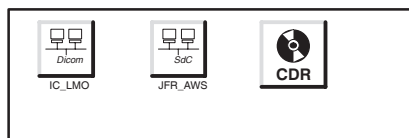
## 6-6 Interchange Media



If the Interchange Media option is installed on the system, you can use the **(Push)** button below the patient list, Exam list or Image list on the Browser to save selected information on CD-R (CD-Recordable) disks.  
See Chapter 13 (Interchange Media).

## 7. NETWORK TRANSFER

### 7-1 Network options



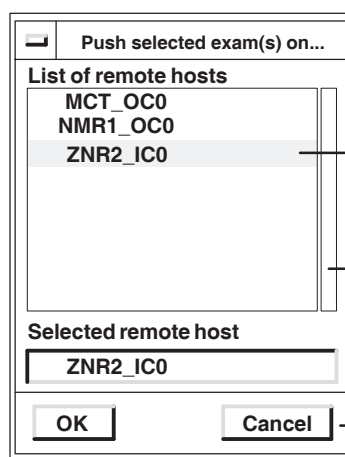
The Senographe 2000 D system can be provided with a networking option, allowing you to transmit acquired images to other DICOM-compatible review stations. When the system is connected to other workstations or storage devices, they are represented by icons in the **Network** panel.

The Senographe 2000 D can also be connected to a mass archiving system. The acquired images will then be sent automatically or manually (user's choice) to the archiving device for permanent storage. A list of patients imaged on the Senographe 2000 D system will be maintained on the mass archiving device, ensuring quick and easy data retrieval.

### 7-2 Transfer

To copy patients, studies series, or images to another workstation or storage device ("remote host"):

- Select the items you want to copy to the remote host in the Patient name, Study ID, series, or imageslist.
- **Either:** Drag the selected group, using the middle mouse button, and drop it over the icon representing the remote host in the Network Panel,  
**Or:** Use the Push function; click on the **(Network Push)** button under the list, to open the **Network Push** window (if the button is not displayed, it can be turned on using the Tools menu). A Network Push window is displayed, listing remote hosts:



- Click on name of remote host to select (highlight) it.

If necessary, use the scroll bar to move through available remote hosts.

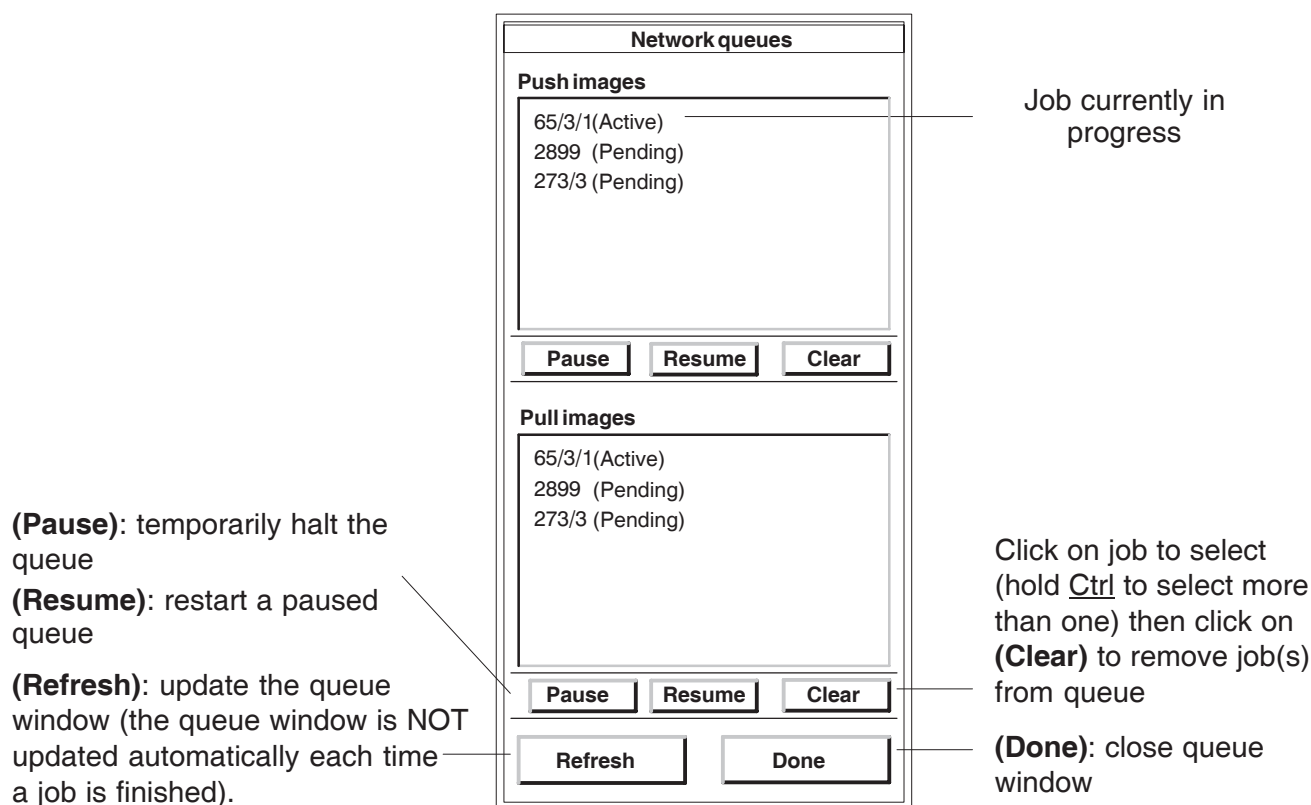
- **(OK)** : initiate transfer  
**(Cancel)** : cancel operation

**Notes:**

- During a transfer, the **Network** icon shows a transfer animation.
- It is possible to start or review an exam on the workstation while a transfer is in progress.
- Studies which are being reviewed, saved, or transferred are flagged as “In use”. When an item is in use it is protected, and cannot be deleted.
- When the transfer is finished, the network icon returns to its static position; the images are now available on the selected distant workstation (remote host).
- If the remote host cannot be reached, a pop-up message reports this fact; you should verify that the remote host is operational and check the network cabling. Call your network manager if the problem persists.
- If the “Auto Push” option is selected from the Browser, then all images in this exam will be automatically sent to the selected destination after exam closure.
- To archive exams on the mass archiver, the archiver must be selected in the same way as a remote host (select its icon as the drag-and-drop target, or its address as the push destination).

During a network transfer:

- To monitor network transfer tasks, click on the **Network** status display to open the **Network queues** window:



## 8. TOOLS MENU UTILITIES

To access the various system utilities in the **Tools menu**:



- Click on the **(Tools menu)** button (near the top right of the Browser screen) to display the utilities menu, then select the desired item from the drop-down menu:

|                                        |   |
|----------------------------------------|---|
| <b>Filter management</b>               |   |
| <b>Browser preferences</b>             |   |
| <b>Messages</b>                        | * |
| <b>Network management</b>              | * |
| <b>Worklist management</b>             | * |
| <b>Printer Management</b>              | * |
| <b>Medical Application preferences</b> |   |
| <b>Edit Patient</b>                    |   |
| <b>Set patient anonymous</b>           |   |
| <b>Service desktop</b>                 | * |
| <b>Restart Browser</b>                 |   |
| <b>Shutdown</b>                        | * |

**Note:** \* Do not attempt to use items shown here with an asterisk. They are intended for use only by your Field Service Engineer and are not described here; uninformed use may lead to unpredictable results.

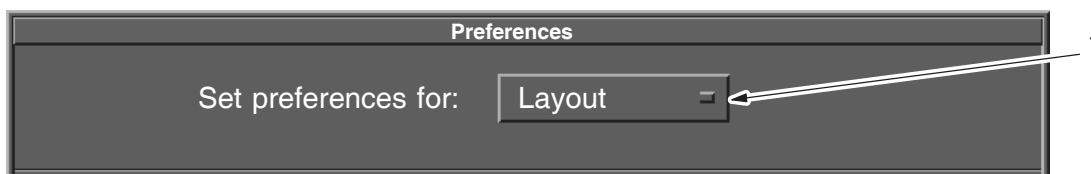
### 8-1 Filter Management

Click on **Filter management** in the Tools menu to Update, Add, or Remove registered filters. See section 9.

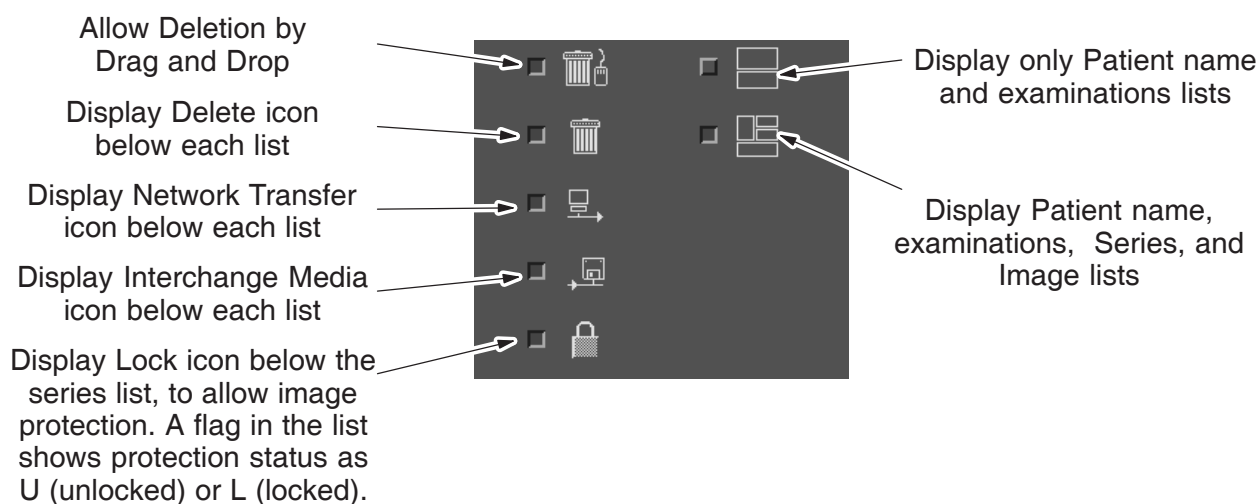
## 8-2 Browser preferences

Click on **Browser preferences** in the Tools menu to display the *Preferences* window, which allows preferences to be set for **Layout**, **Filter** and **Sort**.

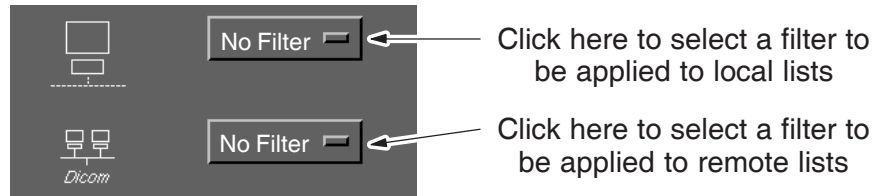
- Click on the selection box (1) to display windows for each of these choices in turn. Each window displays options which are selected by clicking to “depress” the associated buttons.



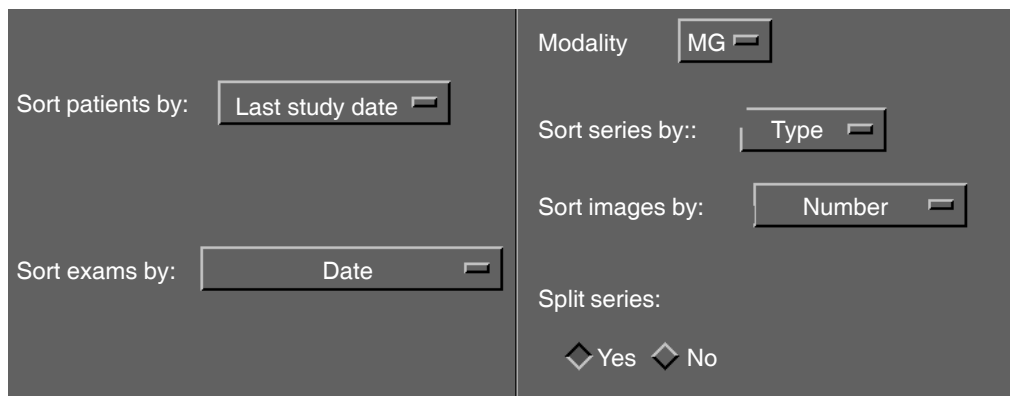
- After making selections in each window, use the five buttons at the bottom of the window to apply or save the changes:
  - Save** Apply the changes to the current display and save them. They will continue to be applied until changed.
  - Apply** Apply the changes to the current display but do not save them. They will be lost when you leave the browser.
  - Reload last saved** After making and applying changes, use this button to apply the last saved preferences.
  - Reset** Apply default settings.
  - Cancel** Cancel your changes and close the window.
- Layout.** This window allows selection of icons and windows to be displayed in the Browser window, as shown below:



**Filter.** This window allows you to specify whether filters (selected from a list of registered filters) should be applied to lists of items held locally (in the AWS) and/or items held remotely (e.g., in a networked remote host).



- **Sort.** Use this window to specify a preferred order for displaying lists of patients and examinations, series and images:



- Note:**
1. Do not change the default choice of **MG** for **Modality**.
  2. Leave the selection of **Split series**: as **Yes**. Other selections are not valid for this system.

### 8-3 Medical Application preferences

Select this option to open a window in which you can set Medical Application preferences for *Auto Push*, *Auto Print*, *Annotations*, *Auto Delete*, *Test Hosts*, and *Names*. To change a setting, click the button beside the option to switch it between selected (■ or ◆) and deselected (□ or ◇). After making changes, click **(Save)** to apply them, or *Close* to leave the window without saving.

#### Auto Push

Select Auto Push ON or OFF, the type of images to be transferred, and the name of the desired remote host.

| medAppPrefs                                                                                                                                                                                                                                                                                                                         |            |             |                |               |             |            |       |               |         |       |        |        |        |         |       |        |        |        |  |       |        |        |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|----------------|---------------|-------------|------------|-------|---------------|---------|-------|--------|--------|--------|---------|-------|--------|--------|--------|--|-------|--------|--------|--------|
| Auto Push                                                                                                                                                                                                                                                                                                                           | Auto Print | Annotations | Auto Windowing | Quality Check | Auto Delete | Test Hosts | Names | Image process |         |       |        |        |        |         |       |        |        |        |  |       |        |        |        |
| Auto Push ◆ ON<br>◆ OFF                                                                                                                                                                                                                                                                                                             |            |             |                |               |             |            |       |               |         |       |        |        |        |         |       |        |        |        |  |       |        |        |        |
| Remote Hosts <table border="1"> <tbody> <tr> <td>loupiac</td> <td>◆ Raw</td> <td>◆ Proc</td> <td>◆ Both</td> <td>◆ None</td> </tr> <tr> <td>stamour</td> <td>◆ Raw</td> <td>◆ Proc</td> <td>◆ Both</td> <td>◆ None</td> </tr> <tr> <td></td> <td>◆ Raw</td> <td>◆ Proc</td> <td>◆ Both</td> <td>◆ None</td> </tr> </tbody> </table> |            |             |                |               |             |            |       |               | loupiac | ◆ Raw | ◆ Proc | ◆ Both | ◆ None | stamour | ◆ Raw | ◆ Proc | ◆ Both | ◆ None |  | ◆ Raw | ◆ Proc | ◆ Both | ◆ None |
| loupiac                                                                                                                                                                                                                                                                                                                             | ◆ Raw      | ◆ Proc      | ◆ Both         | ◆ None        |             |            |       |               |         |       |        |        |        |         |       |        |        |        |  |       |        |        |        |
| stamour                                                                                                                                                                                                                                                                                                                             | ◆ Raw      | ◆ Proc      | ◆ Both         | ◆ None        |             |            |       |               |         |       |        |        |        |         |       |        |        |        |  |       |        |        |        |
|                                                                                                                                                                                                                                                                                                                                     | ◆ Raw      | ◆ Proc      | ◆ Both         | ◆ None        |             |            |       |               |         |       |        |        |        |         |       |        |        |        |  |       |        |        |        |
| Save                                                                                                                                                                                                                                                                                                                                |            |             |                |               | Close       |            |       |               |         |       |        |        |        |         |       |        |        |        |  |       |        |        |        |

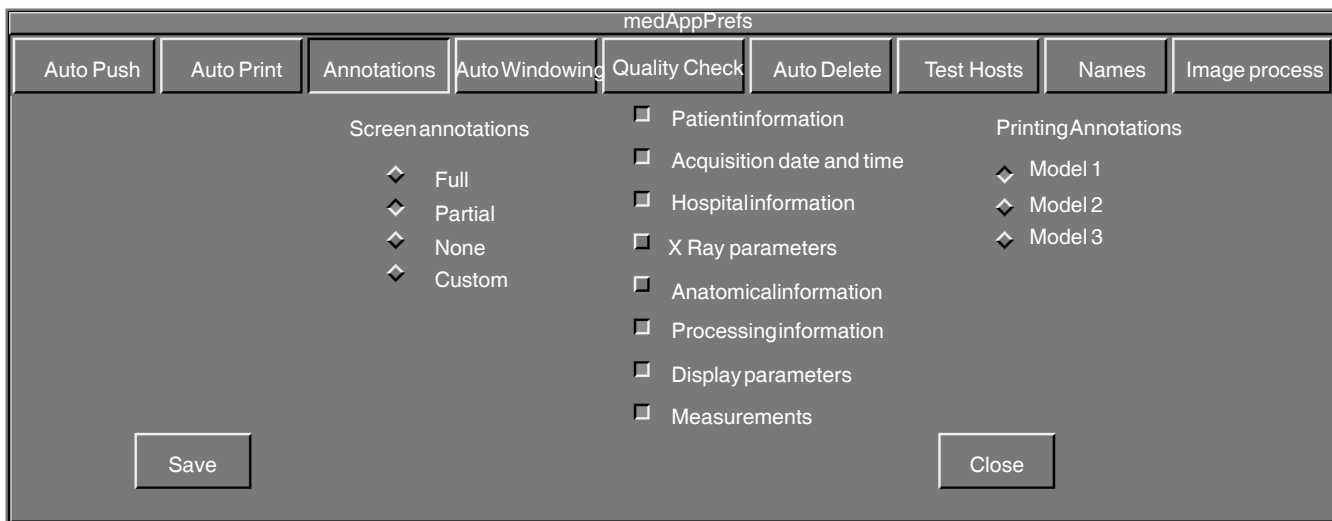
#### Auto Print

Select Auto Print ON or OFF and the name of the desired DICOM printer. Click the Printing properties button to set printing properties if required (refer to Chapter 11 *Printing*). Only the default print mode of Fit to Film is available.

| medAppPrefs                                                                           |            |             |                |               |                            |            |       |               |       |
|---------------------------------------------------------------------------------------|------------|-------------|----------------|---------------|----------------------------|------------|-------|---------------|-------|
| Auto Push                                                                             | Auto Print | Annotations | Auto Windowing | Quality Check | Auto Delete                | Test Hosts | Names | Image process |       |
| Auto Print ◆ ON<br>◆ OFF                                                              |            |             |                |               |                            |            |       |               |       |
| DICOM printers <table border="1"> <tbody> <tr> <td>dummy</td> </tr> </tbody> </table> |            |             |                |               |                            |            |       |               | dummy |
| dummy                                                                                 |            |             |                |               |                            |            |       |               |       |
|                                                                                       |            |             |                |               | Print mode Fit to Film     |            |       |               |       |
|                                                                                       |            |             |                |               | Number Of Copies (1.. 9) 1 |            |       |               |       |
|                                                                                       |            |             |                |               | Printing properties ...    |            |       |               |       |
| Save                                                                                  |            |             |                |               | Close                      |            |       |               |       |

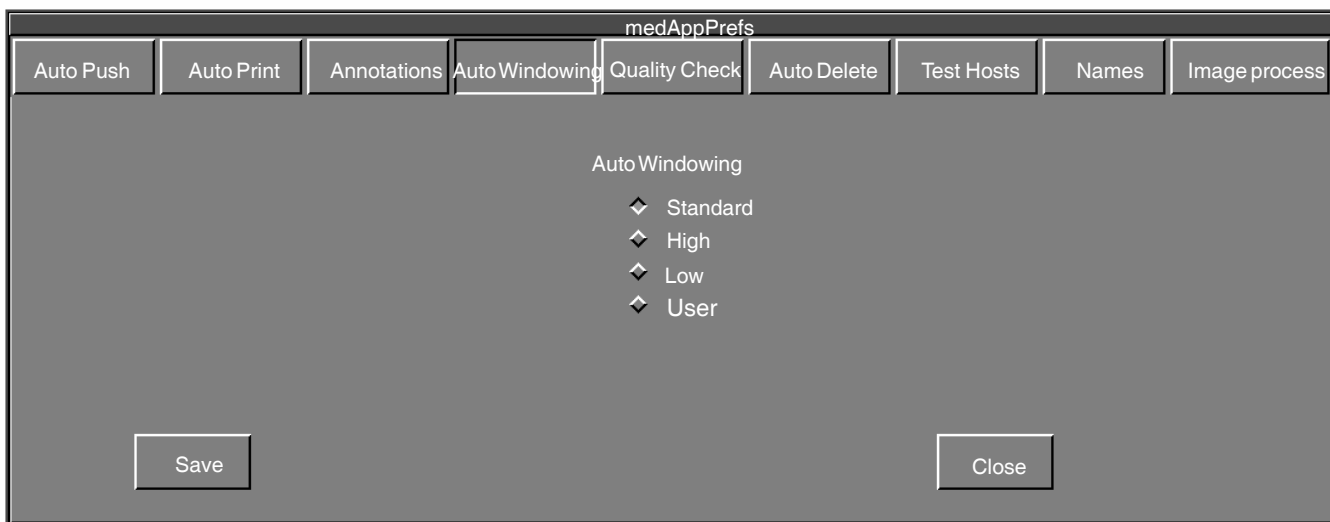
### Annotations

Select the level of screen and print annotation desired. Screen annotation are chosen from *Full*, *Partial*, *None*, or *Custom*; the list of annotation types at the middle of the window shows the current default selections for the selected level. For print annotations, select the model (1, 2, or 3) to be used by default (refer to Chapter 11 *Printing*).



### Auto Windowing

Images are stored with four windowing levels: *High Standard*, *Low*, and *User*. Select which level is to be used as the default when an image is displayed. If *User* is selected, and no *User* level has been defined (by a user saving the image with modified levels), the *Standard* setting is used instead.



However, if the Premium View option is present and enabled (see Image process below), selecting *User* value is considered as if *Standard* value was chosen. The *User* level can be overwritten if the user saves the image with modified levels.

**Quality Check**

Use this screen to change the default value of the Quality Check parameter to OK or NOT OK. The chosen value is automatically applied to all subsequently acquired images, but can be changed by the operator during review after acquisition (see Chapter 9).

**Auto Delete**

Select Auto Delete ON or OFF, and specify the profile of images to be automatically deleted. Raw and/or processed images can be automatically removed from the AWS disk when they have been transferred (*Sent*) to another workstation, or *Committed* by a mass archiver.

Note that when the function is turned on, at least one of the profile buttons must be selected, and if the used disk capacity reaches 95% the oldest exams are deleted by the system to make space for new ones.

**Test Hosts**

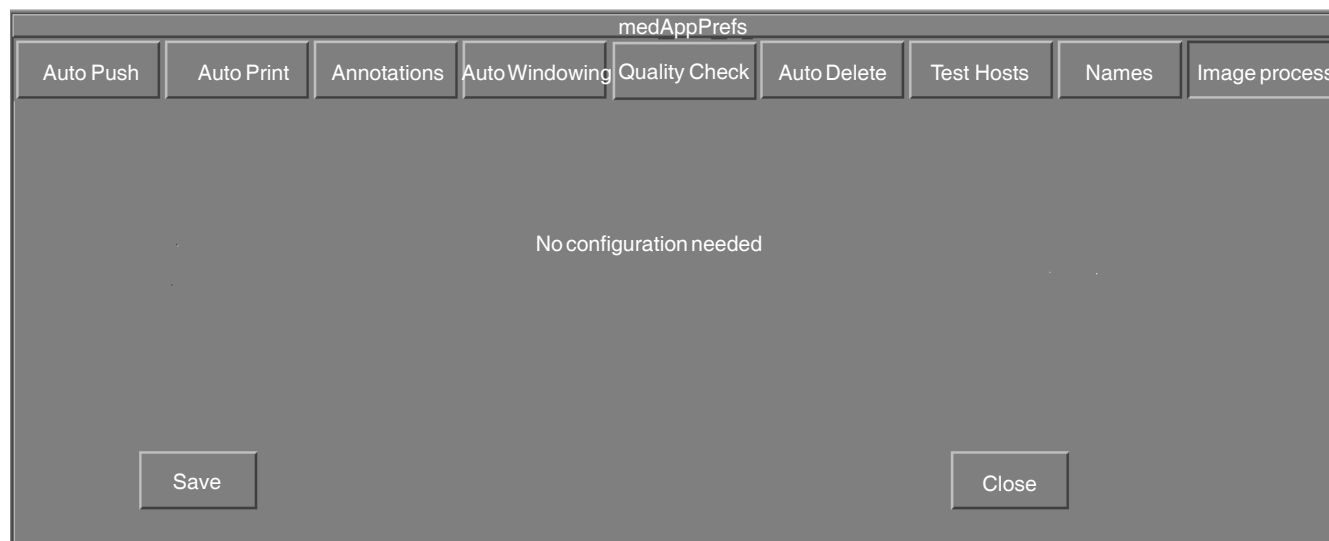
Use this screen to test remote host connections. Select the host(s) to be tested in the three windows (Remote Workstations, Remote Printers, and Remote HIS/RIS servers), and click the *Test selected hosts ...* button to start the test. A message is displayed to indicate whether the test was successful or the host could not be reached.

**Names**

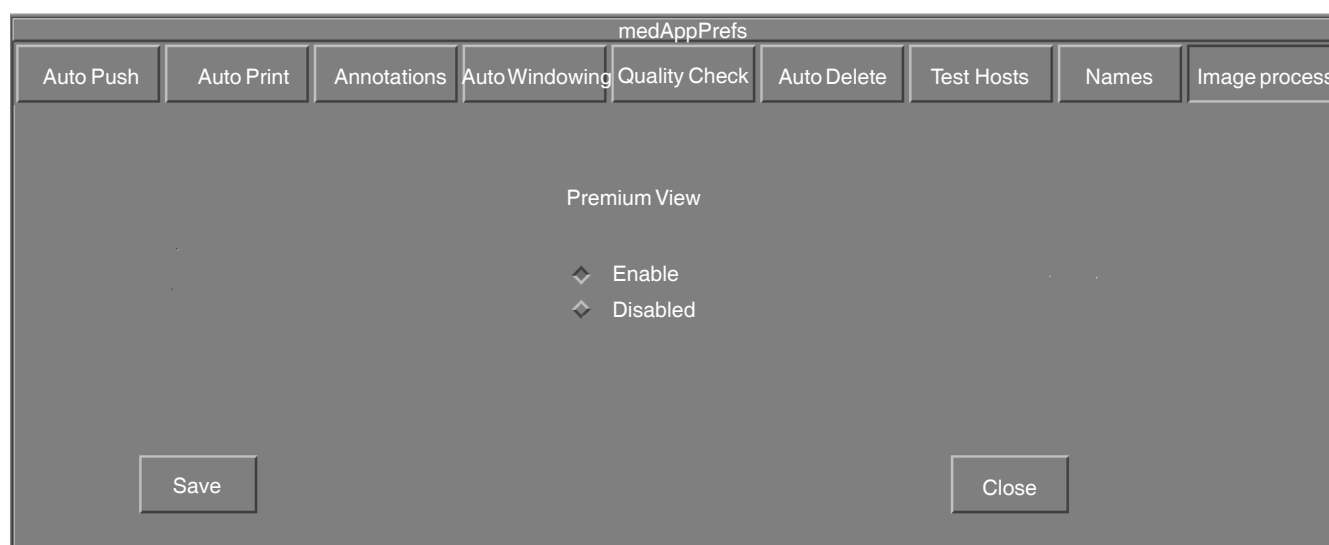
Use this screen to enter and store the names of Operators, Performing physicians, and Referring physicians. The stored names may then be recalled from the database when required, avoiding the need for retyping each time a Medical Procedure Card is created or updated.

## Image process

If the Premium View feature is not installed on your equipment, the following screen is displayed:



If the Premium View feature is installed on your equipment, the following screen is displayed:



Use this screen to enable or disable Premium View.

If Premium View is **enabled**, it is applied to all eligible processed images generated by the Medical Application.

If Premium View is **disabled** (this is the default setting when Premium View is first installed), Thickness Equalization is applied to all eligible processed images generated by the Medical Application.

Refer to Chapter 10 *Image Acquisition Procedure*, section 10 *Processing* for more information on Premium View and Thickness Equalization.

## 8-4 Edit Patient

This option is normally turned off, but may be turned on by a GE Service Engineer if required. It allows information on the patient Medical Procedure Card (described in the *Worklist* chapter) to be viewed and modified after the exam has been closed. Changes are made by creating a new patient or a new examination; the original file is always kept for security reasons.

Any changes made to the *Patient* identity information cause a new patient file to be created, with copies of the existing exams. Fields which can be changed are: name, ID, date of birth, and sex. When changes are made and a save is requested a confirmation message is displayed. If the save is confirmed a message is displayed as a warning that a new entry will be made in the database, and suggests that the old information should be manually removed. Note that if the old records are not deleted, repeated use of this facility can rapidly use up disk space.

## 8-5 Set patient anonymous

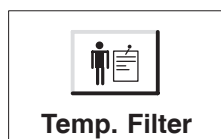
This option allows an anonymous set of images to be created, for discussion with colleagues, etc. Select one or more patients in the Patient name list, then click on the *Set patient anonymous* option in the Tools menu. The patient examinations are copied and used to create a new patient with the name NO NAME and a unique randomly created ID.

## 9. FILTERS

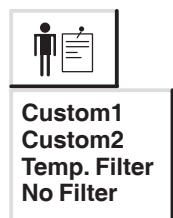
Filters allows the lists of patients and exams shown in the Browser to be “filtered”; in other words, to display only items which correspond to your chosen criteria (for example, between chosen dates, with certain Patient name or IDs, etc.).

Filters can be temporary, in which case they will be lost after the current session. or can be “registered” as a named filter which can then be recalled for later use.

### 9-1 To select a registered filter or create a temporary filter:



The legend under the button in the **Filter Panel** at the top of the Browser shows the current selection for the Browser Filter.



- To change the current selection, click on the **(Filter)** button in the **Filter Panel** and make your selection from the drop-down menu:

|                       |                                                                                                            |
|-----------------------|------------------------------------------------------------------------------------------------------------|
| <b>[Custom...]</b>    | Use registered filters that have defined and saved beforehand (named Custom1 and Custom2 in this example), |
| <b>[Temp. Filter]</b> | Use a temporary filter,                                                                                    |
| <b>[No Filter]</b>    | Display all available patients, examinations and series.                                                   |

### 9-2 Temporary Filter

For occasional queries, use a temporary filter. The filter is used only for the current Browser session, and is not saved.



Temp. Filter

- Click on the **(Filter)** button and select **[Temp. Filter]** in the drop-down menu. The **Local temporary filter** window is displayed in which you can specify the filter characteristics:

- Filters can be specified at **Patient level**, **Exam level**, and **Series level**. By default, **Patient level** is selected first, but you can select these levels in any order; click the appropriate box to start specifying filter criteria.
  - Patient level:** you can choose to begin the listing with a specified Patient name or Patient ID.
  - Exam level:** you can choose to begin the listing with a specified Exam description, Performing physician or Referring physician name. or to list only exams made between certain dates and/or times. Do not use the offered choice of mammography exams (**MG**) or exams from other modalities (**DX**), as the AWS cannot display images from other modalities.
  - Series level:** you can choose to list only exams with a specified text in the Series description, and to list only **SCPT** (secondary capture), **Raw**, or **Processed** exams.

- When you have made your selections in each level, click one or more of the boxes at the bottom of the screen (Patient, Exam or Series) to specify at which level the filter is to apply.

Each choice made at patient, exam, or series level allows you to choose how the specified text is to be used to select listed items:

- “Begins with”. Items are displayed if they begin with the specified letter or word(s).
- “Contains”. Items are displayed if their description contains the specified text.
- “Is”. Items are displayed only if their description matches the specified text exactly.
- At any time you can click **Clear** to delete the choices made and start again, or **Cancel** to return to the previous screen.
- When your selections are correct, click **Apply**.  
The filter is applied, but is lost when the current session ends.

### 9-3 Registered Filters, Filter Management

For repeated queries, use custom filters. A custom filter is defined and saved (registered) separately. Once defined and saved, the name of the custom filter is added to the Filter menu. It can then be used at any time, using the **(Filter)** button and drop-down menu.

-  To create, update or remove a custom filter, select **Filter management** in the Tools menu:

The **Filter selection** window is displayed, giving a list of registered filters and a list of options:

|               |                                                     |
|---------------|-----------------------------------------------------|
| <b>Update</b> | Modify a registered filter (selected from the list) |
| <b>Add</b>    | Create a new registered filter                      |
| <b>Remove</b> | Remove a registered filter                          |
| <b>Done</b>   | Return to the previous screen                       |

- The default choice is **Add**. If you select **Add** or **Update**, the **Local filter** window is displayed, in which you can specify the new or modified filter characteristics.

This window is identical to that used for a temporary filter, except that you must specify a name to identify the filter. On completion, you are asked to **Save** the new or modified filter.

- To apply the filter, return to the Browser and select the filter using the **(Filter)** icon.

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## CHAPTER 8 – WORKLIST

### 1. WORKLIST FUNCTION

The Worklist is a list of scheduled tasks. Typically, it shows all patients scheduled for examination during a working day.

When the Senographe 2000 D system is connected to a Dicom Worklist Management SCP (Service Class Provider) system, entering the Worklist function displays a Worklist downloaded from the SCP system, using the Dicom Basic Worklist Management Service. Downloading information in this way reduces the workload on the AWS, increasing throughput and decreasing the risk of errors. However, Worklist entries can also be made locally, from the AWS.



Click on the Worklist icon at the right of the Browser window to display the Worklist window as shown below. To start an exam, select the required patient task in the list. Selections can be made by clicking with the left mouse button, or by entering appropriate text in one of the three *Selection Criteria* text boxes above the list; *Patient ID*, *Patient Last Name*, or *Accession Number*. When the correct patient task has been selected, click the **(Start Exam)** button or double-click on your selection to continue with Image Acquisition. See oveleaf for more information.

Worklist as of 16:16 January 07 2000

Selection Criteria

Patient ID  Patient Last Name  Accession Number

| Status | Input            | Start Date&Time | +Patient Name | Patient ID   | Procedure Description | Accession # | Study ID |
|--------|------------------|-----------------|---------------|--------------|-----------------------|-------------|----------|
|        | Jan 07 200 15:15 | jones areths    | 2             | left breast  |                       | 2           |          |
|        | Jan 07 200 15:10 | smith anna      | 3             | right breast |                       | 1           |          |

Refresh Worklist Query... Edit... Browser

New Patient... Delete Delete All Start Exam

- The Worklist title shows the date and time of the last update (manual or from HIS/RIS).
- Click the **(Browser)** button to return to the Browser window.
- By default, when the window opens, the Worklist is sorted by Patient Name, the first item in the list in which the number of images is zero is selected, the cursor is in the first selection criteria entry field, and the default push-button is *Start Exam*.
- The Worklist information is displayed in columns. You can sort the entries according to the information in any column, in ascending or descending order, by clicking the title at the head of the column. For example, to sort on patient name, click the **(Patient Name)** button. The entries are automatically displayed in ascending order of name, and a + sign appears in front of the title (*+Patient Name*). Click the button again; a – sign appears in front of the title (*–Patient Name*), and the entries are now displayed in descending order of name.
- Items in the Worklist are selected/deselected in the usual way by pointing and clicking. Non-consecutive multiple items are selected by holding down the Control key while clicking. To select a range of consecutive multiple items, select an item, then hold down the Shift key while clicking another; both items and all in between are selected.
- To find and select an item in the list, use the *Selection Criteria* at the top of the window. As soon as a character entry is made in one of the boxes (*Patient ID*, *Patient Last Name*, *Accession #*), the window scrolls to show and select the first matching entry. When an entry is made in one of the criteria boxes, the other two are automatically cleared.
- Click on the **(Refresh Worklist)** button to download the current worklist from the configured Dicom Worklist Provider. If the Dicom worklist feature is not installed, or the Provider is not configured, this button is greyed out and not active. While the list is being updated, an indicator *WORKLIST LOAD IN PROGRESS...* is displayed, the Refresh Worklist button becomes *Cancel Load*, and all buttons except *Cancel Load* and *Browser* are disabled.
- Click **(Query...)** to display the Query definition window, to define the networked Worklist parameters.
- To delete selected patients, click the **(Delete)** push-button. To delete all patients, click the **Delete All** push-button. User confirmation is requested before deletion.
- Click **(New Patient...)** to display an empty Medical Procedure Card window, allowing a new patient to be added to the list.
- Click the **(Edit...)** button (only active if a single item is selected) to display the Medical Procedure Card window with data for the selected item, allowing you to view and/or add information.
- With the correct patient selected in the Worklist, click **(Start Exam)** or double-click your selection to display the Viewer window and allow image acquisition for the scheduled patient.

## 2. IMAGE ACQUISITION

### 2-1 MEDICAL PROCEDURE CARD

The Medical Procedure Card (MPC) is used to enter all patient-, procedure- and operator-related data. This data will be saved together with the exam images.

There are three ways to enter the data:

- Manually.

The technologist enters the information directly into the MPC fields.

**Note:** only the Patient data fields are mandatory to create an MPC.

- Through a DICOM HIS/RIS system

In this case the Worklist receives directly from the Hospital or Radiology Information System the patient and/or procedure information needed to fill in the MPC.

Information received in this way cannot be modified.

- Using a Barcode Scanner (Optional on Senographe 2000 D)

If your facility produces barcode labels to identify patients and their scheduled exams, all the data stored on the barcodes can be scanned with the Barcode scanner option. Scanning produces an MPC for each patient scanned, saving time and reducing errors as compared with an exclusively manual data entry process.

The screenshot shows the 'Medical Procedure Card' window. It is divided into two main sections: 'PATIENT' and 'PROCEDURE'. The 'PATIENT' section contains fields for 'Last Name', 'First Name', 'Patient ID', 'Birth Date', and 'Sex' (with options for Male, Female, and Other). The 'PROCEDURE' section contains fields for 'Study ID', 'Study Description', 'Accession Number', 'Procedure Description', 'Operator', 'Performing Physician', 'Referring Physician', and 'Scheduled date & time'. On the right side of the 'PATIENT' section, there are three buttons: 'Save', 'Cancel', and 'Start Exam'.

When you select a single patient in the Worklist and click **(Edit...)**, or when you click **(New Patient...)** or **(Start Exam)**, the Medical Procedure Card window is displayed.

- For a new *patient*, all fields are blank; move the cursor (use the mouse, or use the Tab or Enter keys to move through the fields) inside the **Last Name** and **First Name** fields and enter the patient name. Then move the cursor inside the **Patient ID** field and enter the patient ID.
- For a new *study* (existing patient) the patient information fields cannot be modified.

Fill in the other fields as required, then click on the **(Start Exam)** button. The Medical Procedure Card window closes, and the Viewer is displayed.

- For a patient selected on the HIS/RIS worklist, verify that the information in all fields of the medical procedure card is correct and click **(Start Exam)** to begin the exam, or **(Cancel)**.

**Note:** Patient Last Name and Patient ID are mandatory: you cannot start an exam if these fields are not filled in. The remaining information on the card is optional.

- After the first acquisition has been made, the information in the Medical Procedure Card cannot be changed. However, errors can be corrected by creating duplicate information using the *Edit Patient* option in the Tools menu (described in the *Browser* chapter). The original information is saved for security.

## 2-2 Image Acquisition – New Patient...

To start an exam for a new patient:

- Click on the **(New Patient...)** button.  
The Medical Procedure Card window is displayed.

**Note:** A patient must have unique identifiers (name and ID mandatory, first name optional).

- When the card entries are complete, click on **(Save)** to add the patient to the Worklist for future use, **(Start Exam)** to begin the exam, or **(Cancel)** to exit.

If **(Start Exam)** is selected, the Viewer opens with the Medical Procedure Card displayed.

*Check the information displayed.* If it is not correct, do not proceed; select **(Cancel)** and confirm to close the Viewer. On returning to the Worklist, select the correct patient and select **(Edit...)**. Make any changes required, then click **(Start)** to again open the Viewer with the Medical Procedure Card displayed. If the information is now correct, begin the first acquisition.

## 2-3 Edit Patient

To edit patient information (only possible before making the first acquisition for the patient):

- Select the patient in the list and click on the **(Edit...)** button.  
The Medical Procedure Card window is displayed.

This function is not available for information received from an HIS/RIS worklist.

- When the changes to card entries are complete, click **(Save)** or **(Start Exam)**.

## 2-4 Image Acquisition – New Examination

To add an exam for an existing patient:

- Select the Patient Name in the Patient list on the Worklist by clicking on it.
- Click on **(Start Exam)**.

The remaining procedure is the same as for a new patient, except that the patient information fields in the Medical Procedure Card are already complete and cannot be modified (displayed in grey).

## 2-5 Image Review

To review images stored on the workstation image disk, return to the Browser screen:

- In the Browser screen, select the desired images. Select first the patient, and then the exam (study) by clicking on them.  
To select only a specific image for display, click on it in the list. To add more images, click on them in the list while holding down the Ctrl key on the keyboard. t.
- Click the **(Review Exam)** button.

The same functions that are available after image acquisition (image adjustment, measurements, annotations, etc.) are also available in review mode, with the exception of the 2D Localization function.

### 3. BAR CODE SCANNER (OPTION)

#### 3-1 Optional bar code scanner

The Senographe 2000 D scanner is a fast and accurate optional tool for scanning bar code symbols in AWS applications.

Available with an 80mm CCD scanning window and an integrated keyboard decoder, this scanner captures entire bar code symbols instantly. The integrated decoder then transmits the data to the AWS workstation just as if data were entered from the AWS keyboard.

The supported bar codes symbologies are:

- Code 3 of 9 (standard & full-ASCII).
- EAN 13.
- Code 128.

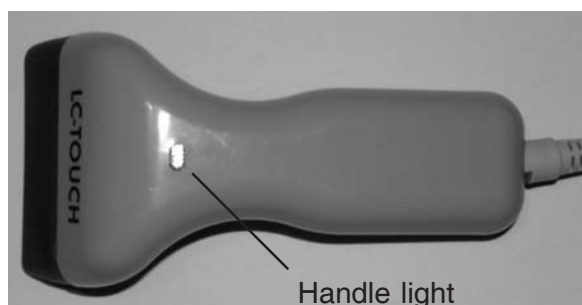


Figure 1 – bar code scanner – top view

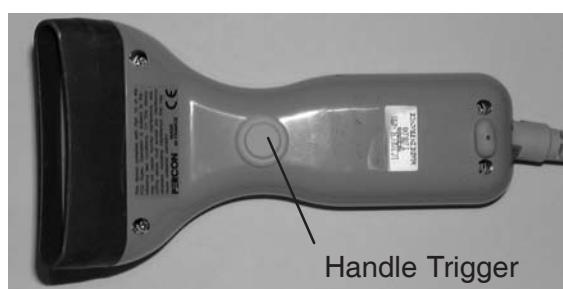


Figure 2 – bar code scanner – bottom view

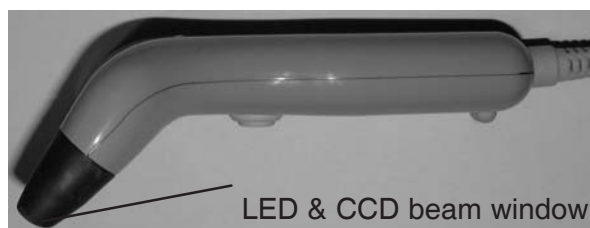


Figure 3 – bar code scanner – side view

### 3-1-1 How to read a bar code symbol

The Senographe 2000 D bar code scanner is simple to use – just aim and shoot. Before using it, make sure all cable connections are secure.

1. Hold the scanner handle horizontally (Figure 3 – ) directly over the bar code.



**Figure 4 – Sample bar code symbol (code 128)**

2. Press the scanner trigger located below the scanner handle: the scan red LED beam lights. The scanner has successfully read the symbol if:
  - You hear a beep.
  - The LED beam turns off.
  - The handle light turns red.

### 3-1-2 Set default configuration

The scanner should already be configured. If not, programming the scanner is easy. You just scan bar code menus.

In case you need to reset the bar code scanner to the supported AWS configuration, follow the steps below:

1. Reset the bar code scanner to the factory settings. Wait until you hear 3 beeps.



2. Start Settings . You shall hear 2 beeps.



3. Set Full ASCII transmission to allow extended Code 39 characters transmission.



4. Set Extended Full ASCII to allow Function keys transmission on two characters.



5. Configure the keyboard emulation model setting.



A EU

6. Enter code 719 to support the AWS QWERTY keyboard.



AG7



AG1



AG9

7. Set the keyboard to CAP LOCK OFF mode after symbol transmittal.



DHI

8. End Settings. You will hear 2 beeps.



⌂ + ⌂

Refer to the scanner documentation for more details on how to setup the scanner.

### 3-1-3 How to enter an AWS text field

1. Click to set the AWS keyboard focus in the text field you want to enter.
2. Scan the bar code symbol as described in section § 3-1-1. The decoded text is displayed in the text field just as if you typed it using the keyboard.

### 3-1-4 What If ...

#### Nothing happens when you follow the operating instructions:

- Check the system power.
- Check for loose cable connections.

#### The AWS workstation goes back to monitor ok prompt:

Resetting or disconnecting/reconnecting the bar code scanner may make the workstation return to the AWS monitor ok prompt. In this case

- type the go command to return to the normal working mode.

**The scanner does not read a bar code symbol:**

- Be sure the scanning system is programmed to read the type of bar code you are trying to scan. Refer to section § 3-1-2 "Set default configuration".
- Be sure the bar code symbol is not defaced.
- The scan head must touch and cover every bar and space on the symbol as shown in Figure 5 – . You can tilt the scanner forward or backward. Practice will quickly show you the ranges to work within.



**Figure 5 – Scan the entire symbol**

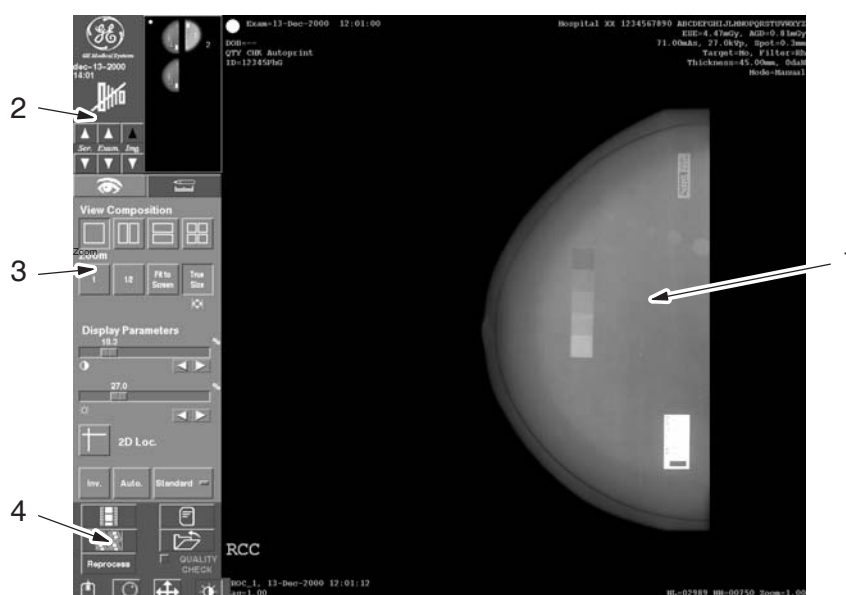
Blank page.

## CHAPTER 9 – VIEWER

### 1. OVERVIEW

- The Viewer window is displayed:
  - when the **Review Exam** button in the Browser window is clicked after selection of a Patient, examinations or series. The Viewer window opens and displays the first selected image.
  - when the **Start Exam** button in the Worklist window is clicked after selection of a Patient in the Worklist. The Viewer window opens, with the Medical Procedure Card displayed, ready to display the acquired image.

The Viewer is used to display, manipulate, and analyze images that have been acquired using the Digital Detector or recalled from the image disk for review.



- Most of the screen is used for the *Viewing Area* (1), in which images are displayed.
- At the left of the screen, there is a Command window, which includes three main sections:
  - The Mosaic Image Browser (2).
  - The Control Panel (3).  
Two selection buttons at the top of the panel allow one of two different Control Panels (*View Control* and *Annotation*) to be displayed, according to the functions required. Functions available from the two panels are described in section 2.
  - Function panel (4). Provides access to the Medical Procedure Card, image reprocessing, image printing, Middle mouse button function selection, and exit from the Viewer.
- To leave the Viewer, click the **(Close Exam)** button  in the Function panel. All changes to annotations are saved. If changes have been made to brightness or contrast settings, you are asked to Exit with save, Exit without save, or Cancel.

#### NOTICE

**All processed images in Medical Application preferences are in log format. To make measurements on an image acquired in Medical Application preferences, the raw image (which is in linear format) should be used.**

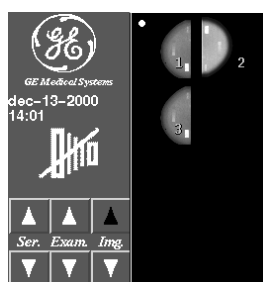
## 1-1 Viewing Area

You can choose to have one, two or four images displayed in the viewing area. See section 2 (View Control) on how to select the desired layout.

To make it easier to view the images in the viewing area, you can place a "shutter" (mask) over the command window.

- Press the **F10** function key (in the top row on the keyboard) to place the shutter. Press the **F10** key again to bring the command window back into view.

## 1-2 Mosaic Image Browser



The Mosaic Image Browser shows the content of the current exam in the form of thumb-nail (reduced size) images. Up to eight such images can be displayed at one time.

If the current exam contains more than eight images, use the *Img.* up/down arrow buttons to scroll through the full set.

To view images from the next or previous Series or Exam, use the corresponding up-down arrow buttons (*Ser.* or *Exam.*).

Click on the desired image in the Mosaic Image Browser to display it in the viewing area.

A white dot on the reduced image in the Mosaic Image Browser identifies the currently displayed image.

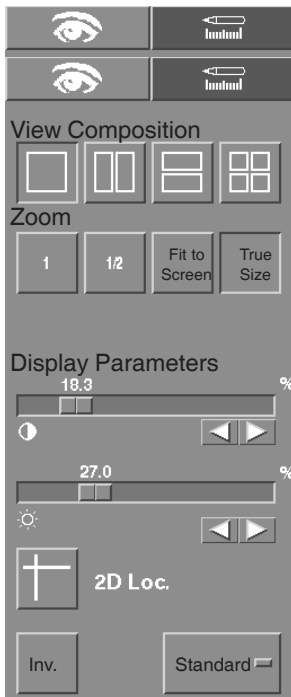
A camera icon  appears above the arrow buttons when the Viewer is being used for image acquisition. When the Viewer is used for image review, the icon appears with a bar , and image acquisition is inhibited.

## 1-3 Image Selection

To work on an image in the viewing area, it must be *selected* (active). To select an image, click anywhere on it. The selected image is identified by a large white dot in the upper left corner.

## 2. VIEW CONTROL

To use the *View Control* Control Panel, click on the View Control “eye” icon  to highlight it.



- **View Composition.** Click on the appropriate icon to display a single image, two images side by side, two images one above the other, or four images. Images are arranged in order (left to right, top to bottom) according to the order in which they were captured. To display images on the monitor according to the ACR standard, they should therefore be captured in the order: RCC, LCC, RMLO, LMLO.
- **Zoom.** Click on the appropriate Zoom icon to choose a Zoom factor. See description below.
- **2D Localization.** Click on this icon to display horizontal and vertical lines on the screen; they can be moved with the mouse to identify a particular position on the image. This facility is available only in acquisition mode (with the camera icon  displayed in the Mosaic area). See description below.
- **Contrast and Brightness** (window width and window level) sliders . See description below.
- **Image Control.** Use these controls to choose appropriate display parameters. See description below.

### 2-1 Zoom

When the image is first displayed in the viewing area, it is displayed with a Zoom factor called “Fit to Screen”. The Zoom factor is calculated so that all of the image is displayed in the space available in the viewing area.

- Click on the appropriate **(Zoom)** button to select the desired Zoom factor:

**Zoom=1** corresponds to a full resolution display: each pixel on the screen corresponds to a pixel on the Digital Detector.

**Zoom=1/2** corresponds to a half resolution display: a pixel on the screen corresponds to the average of 4 pixels on the Digital Detector.

**Fit to Screen:** the image is displayed at a Zoom factor that optimizes the screen layout.

**True Size:** the image on the screen is displayed with the same size as that of the breast that is being imaged. This facility is not available when viewing SCPT images.

## 2-2 2D Localization

In acquisition mode (with the camera icon  displayed in the Mosaic area), the 2D Localization function allows you to display and position a set of cross-hairs on the image.

These are used on images acquired using the Graduated Biopsy Compression Paddle (option) to precisely locate a point of interest on the image, in order to introduce a needle.



- Click on the **(2D Localization)** button to display the cross-hairs on the image.
- Move the mouse pointer onto the intersection of the cross-hairs, then press and hold the left mouse button. The cursor changes to a pencil shape, and you can move the cross-hairs by moving the mouse.  
Move the cross-hairs exactly over the point of interest; you can now read their position relative to the graduations of the compression paddle on the image.
- Click again on the **(2D Localization)** button to remove the cross-hairs.

**Note:** When you close the exam, any 2D Localization cross-hairs on an image will be saved with the image, and will be displayed again when the image is selected for review at a later stage.

On an image that has been saved on the database and is recalled in image review mode, the 2D Localization cross-hairs can no longer be modified or deleted.

## 2-3 Contrast and Brightness sliders

To use the sliders for precise adjustment of image contrast and brightness, you can:

- Select the cursor of the slider and drag it left or right as required. The value above the cursor changes accordingly and the screen displays the change in contrast or brightness.
- Click on the left arrow or right arrow buttons, just below each slider, to change contrast or brightness by small increments.
- Click inside the slider bar, on the left or on the right of the cursor, to change contrast or brightness by large increments.

The adjustment only acts on the currently selected image (primary selection, indicated by the large white dot in the top left corner).

**Note:** You can also use the Auto. contrast button (see *Image Control*, below) or the Multi-Function mouse button (the middle button) for contrast and brightness control (see section 4-7, *Middle Mouse Button*).

## 2-4 Image Control

### Invert

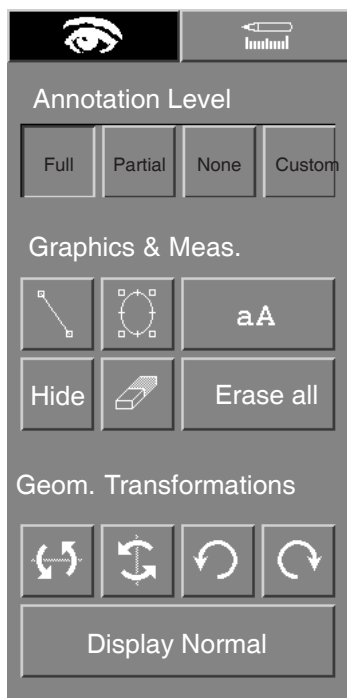
Click the **Inv.** button to invert the image contrast and brightness values, so that any microcalcifications present appear black. Press the button again to return the display to the original default values, so that microcalcifications appear white.

### Auto Windowing

- Four windowing values are stored with the image: *Standard*, *High*, *Low* and *User*. Use the Medical Application Preferences *Auto Windowing* panel (see Chapter 7) to select which of these values is to be used by default when first displaying an image in the viewer. When *User* is selected, and no *User* windowing levels have been defined (by a user saving the image with modified levels), the standard setting is used instead.
- The button at the bottom right of the View Control panel shows the name of the windowing value currently applied. To change it, click the button and select the desired setting from the drop-down menu.

## 3. ANNOTATION

To use the *Annotation Level* Control Panel, click on the Annotation “pencil” icon  to highlight it.



- Annotation Level.* Click on the appropriate icon to select the required annotation level. See description below.
- Graphics & Meas.* Click on the appropriate icon to select and display a measurement tool, to add annotations, or to hide or erase displayed tools and annotations. See description below.
- Geom. Transformations* Click on the appropriate icon to flip or rotate the image, or on **Display Normal** to return to the original display. See description below.

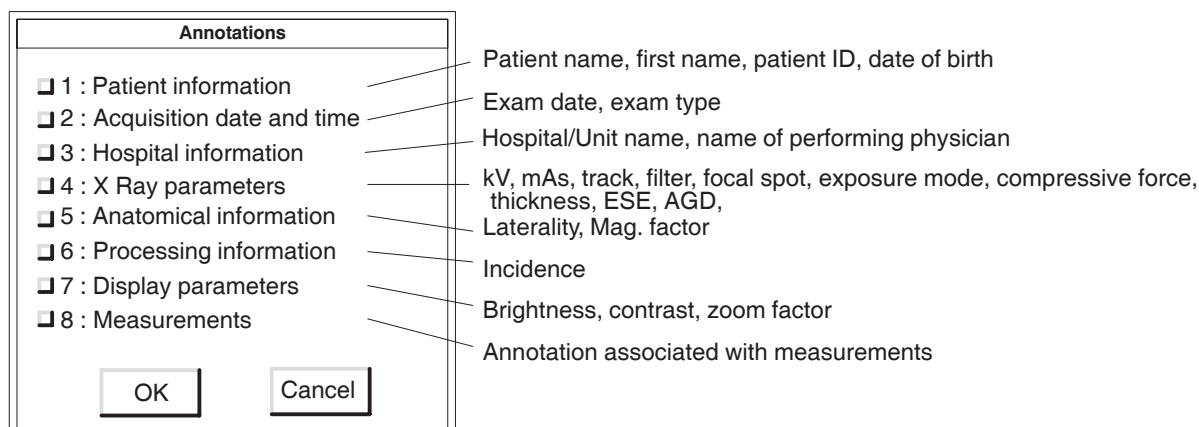
### 3-1 Annotation Level

System annotations are displayed automatically. They show exam-related information such as patient name, patient ID, kV and mAs used, etc. The user can add further annotations (see Graphics & Meas.).



- To select which annotations are displayed, click on the desired button on the control panel.:
  - (Full):** All annotations are displayed.
  - (Partial):** A predefined subset of annotations is displayed. This facility is not available when viewing SCPT images.
  - (None):** No annotation is displayed on the image.
  - (Custom):** This button opens the **Custom** window (shown below) with the list of available annotation groups. This facility is not available when viewing SCPT images

**Custom Annotations** window:



- A small square button is displayed next to each group. To select the annotation groups that you want displayed, click on the corresponding button. To deselect a group, click on the square a second time.
- Click on **(OK)** to use the selected annotations, or on **(Cancel)** to cancel the operation.

### 3-2 Graphics & Meas.

These buttons allow you to add graphic and text annotations to the image, and perform measurements.

You can add several graphic annotations (line segments and ellipses) on the same image. Each annotation is identified by a number, which is displayed next to it. The corresponding measurements, with the same identification number, are displayed in the bottom right corner of the image.

Only the three most recent measurements are displayed. To recall an earlier measurement value on the screen, click on the corresponding line segment or ellipse.

## Segment



- Click the **(Segment)** button to place on the image a line segment that you can use to measure the distance between two points.

The squares at each end of the segment are called handles.

- Press and drag on either of the handles to move the corresponding end of the segment to the desired position. The size and angle of the segment follow the movement of the handles.
- To move the whole segment, select the segment by clicking on any point along the line (except the handles) and drag the segment to the desired position.

The length of the segment (in millimeters) and the angle between the segment and the vertical (in degrees) are displayed in the bottom right corner of the image.

## Ellipse



- Click the **(Ellipse)** button to place on the image an ellipse, that you can use to highlight an area of interest, or to measure the area delimited by the ellipse.

The ellipse is displayed with four handles around it, four tick marks on the ellipse itself, and a cross mark in the center.

- To change the size and shape of the ellipse, press and drag on the handles.
- To rotate the ellipse around its center, press and drag on any of the tick marks.
- To move the actual ellipse, press anywhere on the ellipse (except for the tick marks), or on the center cross, and drag the ellipse to its desired position.

The area of the ellipse (in square millimeters), and the mean and standard deviation of the pixel values within the ellipse, are displayed in the bottom right corner of the image.



**All measurement calculations for graphical annotations (length, surface area, etc.) are made in a reference plane which is 2 cm above the breast contact surface. These values therefore do not correspond to the true size of a pathological feature unless it is situated in the reference plane.**

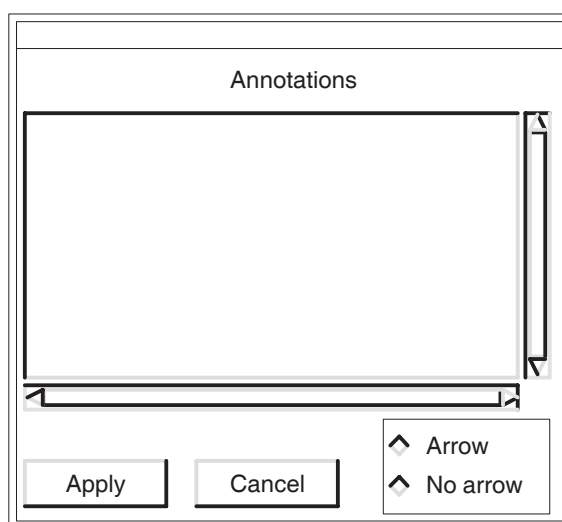
**The gray levels of pixels in raw images follow a linear law; those in processed images follow a logarithmic law.**

## Text Annotation

This function allows you to add text annotations on the image, for example to highlight a specific point for further reference, or as a communication tool for another practitioner.



- Click the button marked **(aA)** to open the **Annotations** window, shown below:



**Text annotations window**

Move the mouse pointer inside the text area. You can now enter the required text.

Use the Enter key to start a new line. To make corrections, move the mouse pointer to the desired place, and click, to position the text cursor. You can now insert text, or use the Backspace key to delete text.

An arrow pointing to the area of interest can be attached to the annotation. To do this, select the small square next to **Arrow**.

When you have entered the text, press the **(Apply)** button. The window closes, and the text annotation appears on the image.

To position the text annotation, select it and drag it to the desired position.

If you chose to attach an Arrow, you can now also select the tip of the Arrow and drag it to the desired position. The length of the Arrow is adjusted automatically.



**Annotations added by the operator on the Acquisition Workstation will be lost during image transfer to the Review Workstation.**

## Displaying and Removing User Annotations



Hide

To hide all user annotations (graphics and text) on an image *temporarily*:

- Click the **(Hide/Show)** button.

To display the annotations again:

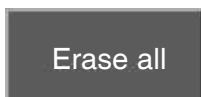
- Click the button a second time.

The button legend alternates between **(Hide)** and **(Show)**. When **(Hide)** is displayed, other measurement tools are not available.



To delete a user annotation (graphic or text) *permanently*:

- Select the annotation by clicking on it. The annotation is highlighted.
- Click the **(Eraser)** button to delete the highlighted annotation.



Erase all

To delete ALL USER annotations (graphics and text) present on the image *permanently*:

- Click the **(Erase all)** button. You are asked to confirm the deletion (Yes or No).

**Note:** The *system* annotations cannot be deleted, but you can use the **Annotation Level** buttons to set the amount of system annotation displayed. See *Annotation Level Level* above.

## 3-3 Geom. Transformations

The buttons in the “Geom. Transformations” section of the panel allow you to flip or rotate the image to improve viewing comfort or for easier comparison with other images.

- Click the button for the desired action.



Flip image around horizontal axis. The top of the image becomes the bottom, and vice-versa. Left/right orientation is unchanged.



Flip the image around vertical axis. The left of the image becomes the right, and vice-versa. Up/down orientation is unchanged.



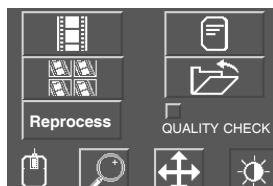
Rotate the entire image 90 degrees to the left.



Rotate the entire image 90 degrees to the right.

- Click **Display Normal** to return the image to the initial orientation (regardless of how many flip and rotate operations were performed).

## 4. FUNCTION PANEL



The Function Panel is used to exit from the Viewer, as well as for access to information on the Medical Procedure Card, Quality Check, image reprocessing, print to Laser camera, and middle mouse button functions.

### 4-1 Medical Procedure Card



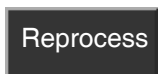
- Click this button to view information on the currently selected patient.

### 4-2 Scrapbook



Click this button or press the F3 keyboard button to open the Scrapbook. This allows you to position selected images on Scrapbook “pages”, ready for printing. See section 5 for more information.

### 4-3 Reprocess



- Click this button to apply the default processing algorithm to the currently selected image. If the image has already been correctly processed, or if it is an SCPT image, the operation will have no effect.

### 4-4 Close Exam (Exit Viewer)



- Click this button to leave the Viewer. If an exam has been reviewed with no changes, the Viewer closes with no message.
  - If changes have been made to image WW or WL, a confirmation box is displayed (Exit with save, Exit without save, Cancel).
  - If New Acquisition has been selected, but closed before images were acquired, a confirmation box is displayed (Yes or No).

## 4-5 Quality Check

The Quality Check function is used with *Auto Print* to allow the user to discard images before printing from the AWS. Images are allocated into two groups: *OK*, and *NOT OK*. Only images allocated as good (*OK*) are automatically printed, but all images are kept in the exam file.

- When first acquired, all images are given the default Quality Check value of *OK*. If required, the default value can be set to *NOT OK*, using the Medical Application preferences *Quality Check* panel (see Chapter 7).



- While viewing an image (raw or processed) in acquisition mode, the Quality Check button in the Viewer Function panel indicates the current value (*QUALITY CHECK OK* or *QUALITY CHECK NOK*). Click the button to switch the status of the image to the other value. The new value is applied to both images (raw and processed).

- This facility is available only in acquisition mode (with the camera icon  displayed in the Viewer Mosaic area). At other times the button is grayed out and the wording on the button is *QUALITY CHECK*.
- If *Auto Print* is active, it applies only to images with a Quality Check value of *OK*. Images with a Quality Check value of *NOT OK* are not automatically printed at the close of the exam.

## 4-6 Print to LaserCam



- Click this button to print the displayed image to a Laser camera (if present). Refer to Chapter 11.

## 4-7 Middle Mouse Button



- Click one of the buttons on this panel to select one of three functions to be performed by the middle mouse button. See below for descriptions of these functions; the default is Contrast brightness control (WW/WL).

### 4-7-1 Magnifying glass

Provides a magnified view (x 2) of part of the image in a moveable square zone.



- Click with the left mouse button on the **(Magnifying glass)** button to select the function.
- To use the function, move the mouse pointer to the part of the view you are interested in; press and hold the middle mouse button.

**Note:** Any annotations or graphics in the magnified zone temporarily disappear.

### 4-7-2 Image scroll

When all of an image is not visible, for example when you have magnified an image by using the Zoom function, this function allows you to move the visible window around the image.



- Click with the left mouse button on the **(Scroll)** button to select the function.
- To use the function, move the mouse pointer onto the view; press and hold the middle mouse button to move the image as required.

**Note:** If the full content of the image is already displayed, the Image Scroll function has no effect.

### 4-7-3 Contrast/Brightness control

This function allows image contrast and brightness to be adjusted by moving the mouse.



- Click with the left mouse button on the **(Contrast/Brightness)** button to select this function.
- To use the function, move the mouse pointer onto the view; press and hold the middle mouse button:  
*Contrast* is controlled by a horizontal movement of the mouse, to the right for more contrast, and to the left for less.  
*Brightness* is controlled by a vertical movement of the mouse, up to decrease brightness, and down to increase it.

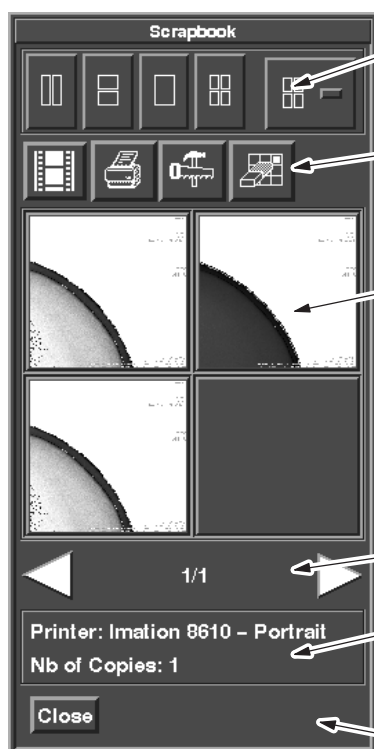
**Note:** Image contrast and brightness can also be adjusted using the Contrast and Brightness sliders, or the Auto Contrast control, all available from the *View Control* Control Panel.

## 5. SCRAPBOOK



The Scrapbook function allows more than one image to be printed on a single film for ease of comparison and reference. Films with multiple images must NOT be used for diagnostic purposes.

- The Scrapbook function allows the user to select images and arrange them in any desired order for printing, by positioning them on “virtual pages” in the Scrapbook. Pages can contain multiple images, according to the layouts available with the currently selected printer, and each page can have a different layout. Pages can be sent for printing individually or all at once.
- A “delete after print” option can be turned on or off, as required. It causes pages to be automatically deleted after printing.
- Only images from a single patient can be loaded into the Scrapbook at one time. Images may be loaded from different exams; a warning is displayed when the first image of the new exam is loaded.
- To use the function, either click the Scrapbook button on the Viewer Control Panel (see section 4-2) or press the F3 keyboard function button. The Scrapbook window is displayed:



- *Layout Formats.* Use these buttons to select the format desired for the current page. See description below.
- *Scrapbook functions.* Use these buttons to select Scrapbook functions; *Print*, *Print Menu*, *Options Menu*, and *Delete Menu*. See descriptions below.
- *Composer area.* This area shows the contents of the current Scrapbook page. It is divided into slots for images, according to the selected layout for the page. Use this area to add and remove Scrapbook images. See description below.
- *Page navigation area.* Use the arrows to display the next or previous pages. See description below.
- *Printer information area.* Shows the current printer settings.
- *Close button.* Use this button to close and empty the Scrapbook. If the Scrapbook contains unprinted images, a warning dialog box asks for confirmation of the Close action.

## 5-1 Layout formats



- **Layout Formats.** Four user-defined buttons show available formats for page layouts. These are usually: 1 x 1, 2 x 1, 1 x 2, 2x 2. Select the format desired for the current page by clicking on the appropriate button.
- If the currently selected printer has been configured to allow more than four layouts, the additional layouts can be selected in two ways:
  - Click the fifth (rightmost) button to display a menu of all page layouts available for the current printer; select the desired layout from the menu to apply it to the current page.
  - The user-defined buttons can be re-programmed to select different layouts; refer to <Options Menu> in section 5-2.

## 5-2 Scrapbook functions

### Print



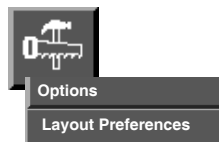
- Click this button to print all pages of the Scrapbook.

### Print Menu



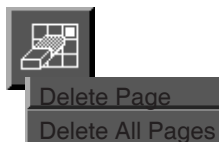
- Click this button to display a menu of print options:
  - Print page:* Prints the contents of the current Scrapbook page.
  - Print all pages :* Prints all pages of the Scrapbook.
  - Printing status:* Displays the Printing status panel (see Chapter 11).
  - Printer Configuration:* Displays the Print Manager panel.

### Options Menu



- Click the Options Menu button to display a two-line pull-down menu;
  - Select Options to display a checkbox which allows you to enable or disable the “delete after print” option.
  - Select Layout Preferences to display a menu of all page layouts available for the current printer. To re-program one of the user-defined layout buttons (section 5-1), select the desired format and apply it to the button by “drag and drop”.

### Delete Menu



- Click this button to display a two-line pull-down menu;
  - Select *Delete Page* to remove the current page from the Scrapbook.
  - Select *Delete All Pages* to remove all pages from the Scrapbook.

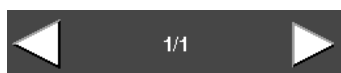
### 5-3 Composer area

This area displays the image or images held on the current Scrapbook page in thumbnail (reduced size) form. Each thumbnail displays the full image, with the same settings (brightness, contrast, invert, rotate, and flip) and the same graphic annotations as the image displayed in the Viewer. However the zoom and the position of the image if it has been roamed in the Viewer are not taken into account, either for display or when printing.

Use the area to add and remove Scrapbook images:

- Use the right mouse button to “drag and drop” an image from the Mosaic Image Browser to an empty slot on a Scrapbook page displayed in the Composer area.
- Press the keyboard function key F4 to load the image currently displayed in the Viewer into the next free slot of the current page of the Scrapbook. If there is no free slot, a new empty page is created and displayed, with the same layout format as the current page.  
If the Scrapbook is not open, the F4 key has no effect.
- To remove an individual image from the Scrapbook, click with the right mouse button on the thumbnail image in the composer area, and answer Yes to the delete confirmation dialog which is displayed.

### 5-4 Page navigation area



- This area displays the current page number and the total number of pages in the Scrapbook, and contains two navigation arrows:
- Click the left arrow to display the contents of the previous page; if the current page is the first page, a warning message is displayed.
- Click the right arrow to display the next page. If the current page is the last one, a new empty page is created and displayed, with the same layout format as the current page.

Blank page.

## CHAPTER 10 – IMAGE ACQUISITION PROCEDURE

### 1. OVERVIEW

This chapter explains the procedure for standard examinations using the Senographe 2000 D, from the preparatory tasks to be performed on the equipment (selection of exposure mode, configuration, etc.) through patient positioning, with notes on the exposure sequence and image processing. In the section on Manual Mode, you will find a table of suggested parameter settings.

An exam using the Senographe 2000 D acquisition application is performed in exactly the same way as a conventional exam (e.g., using a Senographe DMR) in terms of operation and patient positioning.

The major difference is that you use a Digital Detector instead of a conventional film/screen cassette. The images are available on the Senographe 2000 D Acquisition Workstation screen within a few seconds after the exposure.

Raw images can be viewed immediately after they have been acquired, followed by processed images. Images of earlier exams can be recalled from the image disk for review.

### 2. PREPARATION

#### 2-1 Worklist

Exposures can only be made after patient/exam selection from the Worklist (Chapter 8). If the examination has not been scheduled and included in the Worklist, a new entry can be made, but image acquisition is not permitted until basic patient information has been recorded in the system. After selection of the patient for whom you want to start acquiring images, press the **Start Exam** button to continue with image acquisition. The Viewer window (Chapter 9) opens, and exposures are permitted.

#### 2-2 Preparing the Equipment

Set the image receptor, field size, and compression paddle for the required view.

No specific tube warm-up procedure is needed at power on.

Different field sizes and compression paddles can be used.

Choose the appropriate exposure mode. This may be AOP mode (Automatic Optimization of Parameters), described in section 4, or Manual mode, described in section 5.

Use of the AOP Mode provides the best quality/dose compromise, according to the priority selected by the operator, but is not suitable for all examinations.

The digital detector incorporates a removable grid. In general, use of the grid is recommended for standard exposures, but not when magnification is used (no exposure is allowed when the grid and magnification platform are both present). See section 3 (Configuration).

### 3. CONFIGURATION

#### 3-1 Standard exposures

- For standard exposures (contact examinations), the large focal spot is selected by default. Exposures are not permitted if the small focal spot is selected. Check (on the control panel display) that the focal spot selection is shown as *Large*.
- Standard exposures can be made with or without the grid; use of the grid is recommended.

#### 3-2 Magnification

- In magnification, the grid should be removed; the small focal spot is selected by default. Exposures are not permitted if the grid is present or the large focal spot is selected. Check (on the control panel display) that the focal spot selection is shown as *Small*.
- Always make sure that the magnification platform is correctly locked in place before starting an exam.
- The object-detector distance depends on the coefficient of magnification required.
- In manual mode, increasing the kV setting by 1 or 2 kV will reduce exposure time.

#### 3-3 Examination of Chest Wall

Select configurations and kV values to suit thickness and density of region examined.

Use of the grid is recommended.

## 4. AOP MODE

The AOP (Automatic Optimization of Parameters) Mode controls radiation and allows the system to select the main parameters.

It can be used for standard exposures, magnified exposures, or for the examination of the chest wall. See section 3 for additional notes on configuration.

Before each exposure made in AOP mode a brief absorption measurement exposure is made to determine the thickness and density of the breast being examined. This information, together with the priority set by the operator, allows optimization of exposure parameters. The exposure is then made, using the track/filter/kV/mAs configuration which supplies the lowest dose with respect for the user's imaging priority.

The operator chooses one of three options, according to the priority required:

- **CNT** Contrast Gives priority to subject contrast.
- **DOSE** Dose Gives priority to dose reduction.
- **STD** Standard Selects a compromise between contrast and dose.



**BREAST COMPRESSION OF AT LEAST 3 daN (30 NEWTONS OR 6.7 POUNDS) IS ESSENTIAL WHEN USING THE AOP MODE.**

The system automatically selects the following parameters:

- Anode track (Mo or Rh)
- Filter (Mo or Rh)
- kV values
- mAs values
- Focal spot

**Note:** By default, the system selects the large focal spot when a standard exam is selected, and the small focal spot when magnification is selected. Exposures are not possible if these settings are overridden.

## 4-1 Use of Markers in AOP Mode

The algorithm used in AOP mode searches for the most dense part of the breast, and uses this as a reference in its calculations. It is therefore important to avoid the presence of dense objects in the area used by the algorithm.

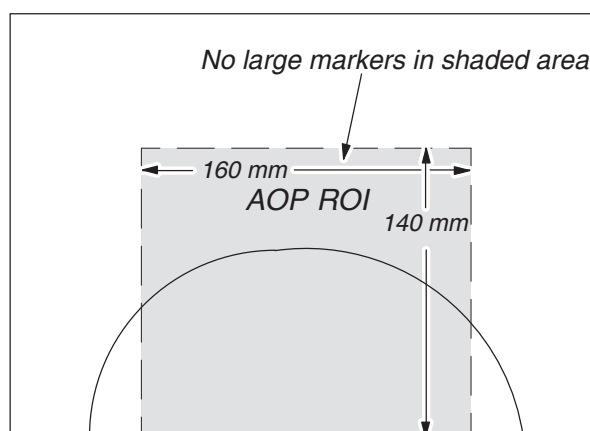
When using AOP mode, do not place large markers such as view name markers in the area used by the AOP algorithm. They may be used anywhere outside this area. Small markers less than 3 mm diameter, such as BB markers, may be used as required.



**Markers larger than 2 mm<sup>2</sup> must not be present in the area used by the AOP algorithm. Large markers will affect the calculation of tissue density, which may lead to a degraded image.**

### Contact mode:

In contact mode exposures using AOP, the area used is an area of 160 mm by 140 mm adjacent to the chest wall side and centered on the image receptor (the shaded area in the diagram).



## 4-2 Mammary implants

Use of AOP mode is **not recommended** for examinations of patients with mammary implants. Manual mode should be used.

## 5. MANUAL MODE

The Manual Mode can be used for standard exposures, implant views, magnified exposures, or for the examination of the chest wall. See section 3 for additional notes on configuration.

The operator selects the following parameters:

- Focal track (Mo, Rh)
- Filter (Mo, Rh)
- kV
- mAs values

**Note:** By default, the system selects the large focal spot (0.3) when a standard exam is selected, and the small focal spot (0.15) when magnification is selected. Exposures are not possible if these settings are overridden.

Select the desired track/filter configuration according to the thickness and density of the breast to be examined, then select suitable kV and mAs values.

Note that while the examination of a very dense breast using the rhodium or molybdenum tracks provides similar contrast images, the same breast examined via the rhodium track benefits from better tissue visualization and a lower average glandular dose.

Refer to Table 1 below (*Suggested Manual Techniques*) for suggested parameter selections according to breast type and thickness.

Table 2 (*Maximum and recommended kV ranges*) lists the available maximum and recommended kV ranges.

For thick (>6 cm) or dense breasts, the Mo/Rh and Rh/Rh configurations may provide equivalent or better image quality with reduced patient dose.

As subject contrast depends on kV values used, note that an increase in the kV value may reduce the radiation dose to the patient. Potential contrast losses will be handled by digital image processing.

A reduction in the kV value improves contrast but increases the radiation dose to the patient.

In manual mode, the choice of priority to dose reduction or to the desired Signal to Noise Ratio is left to the discretion of the operator.

**Note:** If the operator selects an incorrect configuration (filter selection error), the system selects an authorized configuration and automatically changes the filter. A warning message appears on the first line of the readout.

Table 1 – Suggested Manual Techniques

| Compressed breast thickness (mm)                 | Homogeneously fatty |     |               | 50% fatty, 50% dense |     |               | Homogeneously dense |     |               |
|--------------------------------------------------|---------------------|-----|---------------|----------------------|-----|---------------|---------------------|-----|---------------|
|                                                  | kVp                 | mAs | Target/Filter | kVp                  | mAs | Target/Filter | kVp                 | mAs | Target/Filter |
| <b>With grid (contact examination):</b>          |                     |     |               |                      |     |               |                     |     |               |
| < 30                                             | 25                  | 25  | Mo/Mo         | 27                   | 25  | Mo/Mo         | 27                  | 25  | Mo/Mo         |
| 30–40                                            | 26                  | 32  | Mo/Mo         | 27                   | 45  | Mo/Mo         | 28                  | 50  | Mo/Mo         |
| 40–50                                            | 28                  | 45  | Mo/Mo         | 28                   | 63  | Mo/Rh         | 30                  | 45  | Rh/Rh         |
| 50–60                                            | 27                  | 80  | Mo/Rh         | 28                   | 63  | Rh/Rh         | 31                  | 56  | Rh/Rh         |
| 60–70                                            | 29                  | 80  | Mo/Rh         | 31                   | 56  | Rh/Rh         | 32                  | 63  | Rh/Rh         |
| 70–80                                            | 29                  | 80  | Rh/Rh         | 32                   | 63  | Rh/Rh         | 32                  | 140 | Rh/Rh         |
| > 80                                             | 30                  | 90  | Rh/Rh         | 32                   | 140 | Rh/Rh         | 32                  | 160 | Rh/Rh         |
| <b>Without grid (magnification examination):</b> |                     |     |               |                      |     |               |                     |     |               |
| < 30                                             | 25                  | 25  | Mo/Mo         | 27                   | 28  | Mo/Mo         | 27                  | 32  | Mo/Mo         |
| 30–40                                            | 26                  | 40  | Mo/Mo         | 27                   | 50  | Mo/Mo         | 28                  | 56  | Mo/Mo         |
| 40–50                                            | 28                  | 56  | Mo/Mo         | 28                   | 80  | Mo/Rh         | 29                  | 100 | Mo/Rh         |
| 50–60                                            | 29                  | 71  | Mo/Mo         | 31                   | 71  | Mo/Rh         | 30                  | 63  | Rh/Rh         |
| 60–70                                            | 29                  | 80  | Mo/Rh         | 30                   | 63  | Rh/Rh         | 32                  | 63  | Rh/Rh         |
| 70–80                                            | 29                  | 71  | Rh/Rh         | 31                   | 71  | Rh/Rh         | 32                  | 125 | Rh/Rh         |
| > 80                                             | 30                  | 80  | Rh/Rh         | 31                   | 160 | Rh/Rh         | 32                  | 140 | Rh/Rh         |

Table 2 – Maximum and recommended kV ranges

| TRACK | FILTER | KV RANGE   |             |
|-------|--------|------------|-------------|
|       |        | MAXIMUM    | RECOMMENDED |
| Mo    | Mo     | 22 thru 35 | 25 thru 28  |
| Mo    | Rh     | 22 thru 40 | 26 thru 39  |
| Rh    | Rh     | 25 thru 49 | 27 thru 35  |

## 6. POSITIONING THE PATIENT

Women undergoing a mammography examination often feel apprehensive because of the examination and the ensuing diagnosis.

To reassure the patient, receive her in a warm room and provide a simple but precise explanation of the procedure. Pay particular attention to breast compression, which can cause discomfort, but is essential in order to produce a high quality exam and ensure reliable diagnosis.

It is best to examine the breast during the first half of the menstrual cycle (1st through 14th day). The breasts are less tender and less painful before ovulation.

Examination of the breast requires the patient to disrobe from the waist up. An appropriate cover should be provided during the waiting period.

It is important to relax the patient. Any contraction of the pectoral muscles or muscles of the arm can cause an error in positioning.

Elevate the breast and center it on the image receptor over all its surface:

1. Remove folds from the skin.
2. Bring out the nipple and position it in profile when possible. Do not sacrifice breast tissue for nipple profile.
3. Bring out the inframammary angle for applicable views.
4. Compress until the breast surface is taut to the touch (see section 7). Take great care with patients with mammary implants.
5. Use the centering light to check the field size, and ensure there are no artifacts obscuring the breast (e.g. hair, earrings, etc.).

## 7. COMPRESSION

To apply compression to the breast, depress the compression pedal. Manual adjustment can be made using the two knobs, located on each side of the compression paddle holder. Take great care with patients with mammary implants. The compression force is displayed on the Gantry readout panel, and can be displayed on the image as an annotation (see Chapter 9, section 3-1).

**Note:** If the compression force is less than 3 daN, the display shows 0 daN.

The maximum compressive force on this unit is 20 daN.

It is important to use adequate breast compression because the benefits in image quality and dose reduction are significant:

- Compression reduces motion blurring by immobilizing the breast.
- Compression reduces geometric blurring by ensuring direct contact between the breast and the image receptor and by spreading glandular breast tissue.
- Compression improves subject contrast and reduces scattered radiation in proportion to the reduction in thickness of tissue irradiated.
- Compression spreads the breast laterally, giving it a uniform and reduced thickness. This reduces exposure and consequently the mean glandular dose.

Good compression is obtained when the compressed breast is taut to the touch.

**Note:** As a safety measure, the compression system is fitted with magnetic braking to avoid the paddle falling in the event of power loss. If power loss occurs during an examination, a force of around 5 daN will remain on the compression paddle. Disengage the patient by lifting the paddle gently (do not try to lift it quickly) to counteract this compression force.

**Note:** Automatic decompression can be programmed to occur when the exposure is terminated.



After exposure, press  (located on the right of the Control Console) for decompression if automatic decompression is not selected in the program.



In the absence of the compression paddle, leave the space free between the bottom of the paddle arm and the top of the image receptor assembly.

## 8. THICKNESS

The thickness of the compressed breast is used in determining the glandular dose (AGD), and for AOP calculations. It is displayed on the Gantry readout panel, and can be displayed on the image as an annotation (see Chapter 9, section 3-1).

**Note:** If the compression force is less than 3 daN, a thickness of 45 mm is displayed, regardless of the true thickness of the breast.

## 9. IMAGE ACQUISITION

**Note:** When Right/Left image pairs are acquired, it is recommended that, the Right image should always be acquired before the Left. This ensures consistent display when using the 2 x 1 view; selection of the first image displays the pair with the two chest walls in the center of the screen.

- The image acquisition function must be entered from the Worklist function. Select the correct patient in the Worklist (a new patient can be created if necessary), and click the **Start Exam** button in the Worklist window, to display the Viewer window and permit exposures.
- When ready for the exam, check the image information displayed on the Gantry Console. It should include:
  - The Support Arm angle, if other than 0°.
  - The magnification coefficient (e.g., M 1.5), if magnification is used.
- Select the breast laterality (right or left), or Cleavage if no laterality. The Console should now show:
  - Laterality (R or L).
  - View name (e.g., LCC, RML, LLM, etc.).
- Check the displayed view name. For special views or recumbent patients, modify the view name manually:
  - a. *Special Views for standing or sitting patients.* Refer to section 6-3 in Chapter 4; use the **Special Views Selection** key (key ⑩ in section 3, Chapter 4) to modify the view name.
  - b. *Recumbent patients.* Refer to section 6-4 in Chapter 4; press the control console **SET UP** key (key ③ in section 3) and use the **VIEW/RECUMBENT PATIENT** menu to select the appropriate view name.

### NOTICE

**When the patient is positioned for a Cleavage view (CV), external markers must be used to assist in determining laterality when viewing the image. Place a Right (R) or Left (L) marker in the lateral aspect of the breast of interest, or place markers on the lateral side of each breast. Markers must be placed outside of the 140 mm x 160 mm ROI used by AOP see Chapter 10.**

- To display the acquired images on the AWS in the same order as films hung in the conventional order on a viewbox, it is suggested that patient images should be acquired in the following order:
  - RCC
  - LCC
  - RMLO
  - LMLO.
- When all parameters are correctly chosen and the patient prepared, make the exposure in the usual way using the Prep and Exposure buttons.
- After the exposure, the image acquired by the Digital Detector is automatically transferred to the workstation, added to the exam and displayed on the Viewer screen as a raw image. During the transfer of the raw image all user interface functions are disabled.

- The new image has the chosen default Quality Check value (OK, or *NOT OK*). This can be changed at any time while viewing the image (raw or processed), by clicking on the Quality Check icon in the *View Control* panel; the new value is applied to both the raw and processed images. Refer to section 4-5 in Chapter 9.
- Processing of the image is started automatically. See below for a discussion of processing considerations.
- The processed image replaces the raw image within a few seconds; it is displayed with a standard contrast level, but the user can choose a higher or lower contrast level using the View Control contrast setting (see Chapter 9 “Viewer”). After changing contrast select **(Auto)** to display the image with the new setting.
- As soon as an image has been transferred and displayed on the screen, the system is ready for the next exposure. The images (first raw, then processed) from the new exposure replace the previous image in the Viewer.

## 10. PROCESSING

Images received from the Digital Detector are displayed on the monitor as *raw* images immediately after acquisition. Raw images are low contrast. After acquisition, a number of calculations are applied to the image to create the *processed* image, which replaces the raw image on the screen.

Note that both processed and raw images are saved. The raw images are saved in the DICOM MG “for processing” format so that processing can be carried out later if required, perhaps using a hospital-specific algorithm. The processed images are saved in the DICOM MG “for presentation” format, ready for review.

The main calculations that can be applied to create the processed image are:

- Collimator Detection. This applies a black mask around the useful image area, covering areas which would otherwise be white. It allows more comfortable viewing.
- Pseudo-log Transformation. This facilitates the manipulation of brightness and contrast during the review. After the transformation the image dynamic range is reduced to 12 bits, without loss of clinical information.
- Thickness Equalization or Premium View . If the Premium View option is not present or is not enabled in medical preferences (see Chapter 7 *Browser*, section 8-3 *Medical Application preferences*), Thickness Equalization is applied. If the Premium View option is present and enabled, Premium View is applied:
  - Thickness Equalization. Subcutaneous tissues can be difficult to see on the screen because of monitor display limitations. This is corrected by applying a thickness equalization algorithm to decrease the image dynamic range. Image information beyond a threshold level of gray, selected to correspond to subcutaneous tissues, is modified for more visibility. The end result is clear visibility of the medical information in all regions of the breast. When this algorithm is used, the processing description applied is referred to as Proc 1.

The Thickness Equalization algorithm is not applied to the following images:

- Magnified, Spot and Collimated views.
- Images in which the breast tissue covers 100% of the digital detector panel area.
- Images with certain combinations of manually selected parameters.  
The processing description applied to these images, when the thickness equalization algorithm is not used, is referred to as Proc 0.
- Premium View (option). This is an image processing algorithm which increases the visibility of breast structures. The main advantage is to provide a single breast image in which the contrast in the fatty tissues is similar to that obtained by setting WW (window width) and WL (window level) for optimum visualization of fatty tissues, and the contrast in the fibro-glandular tissue is similar to that obtained by setting WW and WL for optimal visualization of fibro-glandular tissues. The Premium View algorithm also includes a thickness equalization algorithm to enhance the visibility of subcutaneous tissues.

Under certain specific conditions (e.g. particular exposure techniques) the Premium View algorithm cannot be applied.

**Note:** Premium View is an image processing algorithm optimized for the structure of breast images.

- When imaging an object with thick or sharp borders (e.g., a phantom), you may see an enhanced brightness at the border of the object. This enhancement is normal and is not expected to affect correct phantom scoring.

- Auto-contrast. This improves image quality by optimizing the levels of brightness (window level) and contrast (window width) in the image.
- As soon as the selected algorithm has been applied, the processed image replaces the raw image on the screen. The operator can select which of four levels of contrast should be applied (*High*, *Low*, *Standard*, or User defined, selected in the Viewer Control Panel window). For Premium View, there is no predefined user value, but User level can be set if the user saves the image with modified levels.

## CHAPTER 11 – PRINTING

### 1. INTRODUCTION

Any GE-recommended high resolution DICOM laser camera can be connected to the Senographe 2000 D for printing hard copies of digital images. For compatible printers, see the latest product data sheets for this system, which you can obtain from your local sales representative.

Printing is very simple. You can use the Auto Print function for automatic printing of newly acquired images on the closure of an exam, or manual printing to print individual images from the Viewer window.

Note that only processed images can be sent for printing by the Senographe 2000 D, and that only one image per film is available; prints are approximately 95% of natural size.

Modifications made to the image (other than window width and window level) are not printed.



Only films formatted to print a single mammogram per sheet of film may be used for diagnostic purposes, and only images printed to 8 x 10 inch film have been validated for diagnostic purposes. Do NOT use films formatted to print multiple images per sheet of film for diagnostic purposes.



The size of the printed mammogram depends on the type of workstation used to send the image to the printer, and which printing method is used to print the film. Use the following table for guidance.

Clinical studies validating full-field digital mammography performance have only been carried out using the image size designated as 'Reference' in the following table.

Table 1 – Relative Sizes of Printed Mammograms From Review and Acquisition Workstations

| Workstation               | Printing Method           | Linear Size Comparison |
|---------------------------|---------------------------|------------------------|
| RWS or Seno. Advantage    | Print Original Image      | Reference              |
| RWS or Seno. Advantage    | Print Screen              | 3% reduction           |
| AWS, Print Models 1 and 2 | Automatic or Manual Print | Same as reference      |
| AWS, Print Model 3        | Automatic or Manual Print | 4.5% reduction         |

## 2. PRINTER MANAGEMENT

Printers are set up and declared to the system at the time of installation by the GE Field Engineer; printer information cannot be changed by the user.

The access to this function is from the tools menu



## 3. PRINT FUNCTIONS

### 3-1 Auto Print

Auto Print is a function allowing the user to automatically initiate the printing of exam images on closure of the exam from the AWS.

To use Auto Print, access the Auto Print setup tool. Click on *Auto Print* in the *Medical Application preferences* window (available in the *Browser Tools menu* menu, as described in section 8 of Chapter 7, *Browser*).

Only images with a Quality Check value of OK are automatically printed by the Auto Print function. Images with a Quality Check value of *NOT OK* are not automatically printed at the close of the exam.

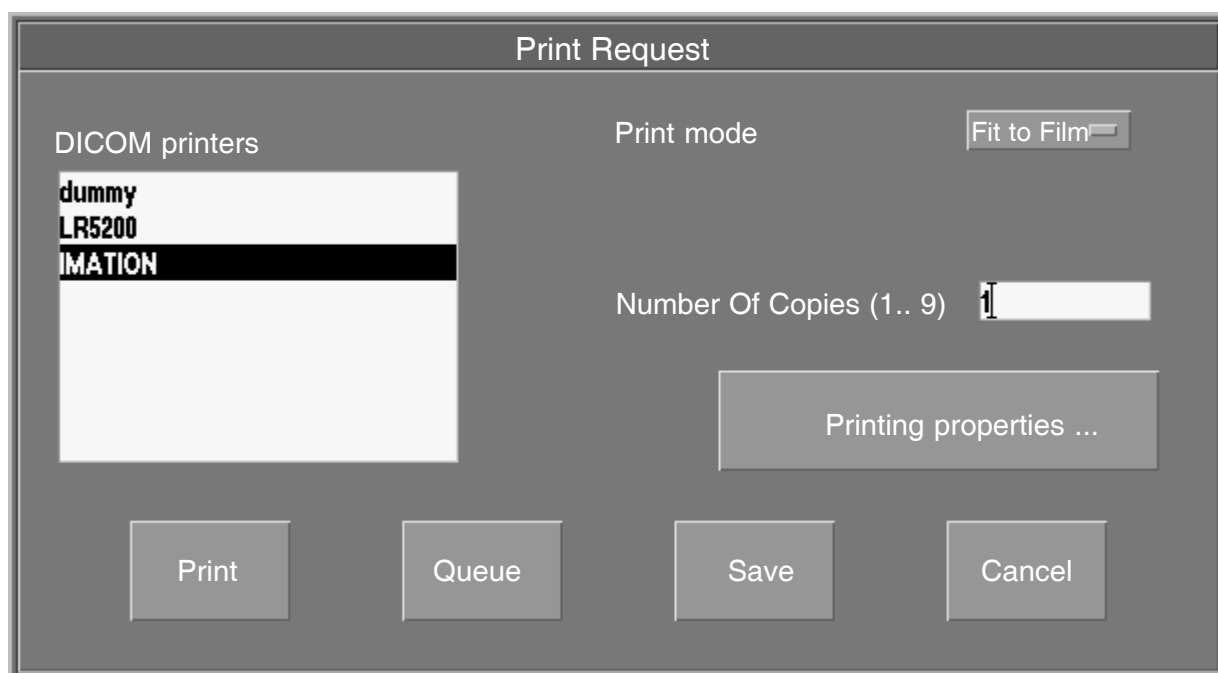
Facilities available from the *Auto Print* window are:

- *DICOM printers*: contains the list of all the available DICOM printers that have been declared for printing. Click on a printer in the list to select it.
- *Auto Print* buttons: click the On button to turn Auto Print on for the selected printer or the Off button to turn it off. The selected button becomes dark gray.
- *Save* button: click this button to confirm any changes made and close the window.
- *Close* button: click this button to close the *Medical Application preferences* window. If the user has made changes to the Auto Print window, a Warning window opens requesting the user to either use:
  - *Save* button (to save the changes and return to the Browser).
  - *Cancel* button (to close the Warning window and return to the Auto Print window).
  - *Discard* button (to close without saving the changes and return to the Browser).
- *Print mode*: only Fit to Film. Can not be changed by the user in current Senographe 2000 D release.
- *Number of Copies* box: enter the required number of copies in this box.
- *Printing properties* button: click this button to open the *Printing Properties* window (see below § 3-3).

### 3-2 Manual Print

In addition to the Auto Print function, an image displayed on the Viewer screen can be printed at any time under manual control.

Click the Print button  in the Viewer Function panel to open the *Print Request* window.



Facilities available from the *Print Request* window are:

- **DICOM printers:** contains the list of all the available DICOM printers that have been declared for printing. Click on a printer in the list to select it.
- **Print mode:** Can not be changed. Fit to Film only.
- **Number of Copies box:** enter the required number of copies in this box.
- **Printing properties** button: click this button to open the *Printing Properties* window (see below § 3-3).
- **Print** button: click this button to print the displayed image on the currently selected printer.
- **Queue** button: click this button to open the Printing status window (see below § 3-4).
- **Save** button: click this button to confirm any changes made and close the window.
- **Cancel** button: click this button to cancel any changes made and close the window.

### 3-3 Printing Properties

This window is accessed from either the *Auto Print* window or the *Print Request* window. It displays the properties set for the selected printer.

The screenshot shows a 'Printer properties' dialog box for the AGFA LR5200 printer. The dialog has a title bar 'Printer properties' and a subtitle 'AGFA LR5200'. Below the subtitle, there are six settings, each with a label and a dropdown menu:

- Format: Standard
- Media type: Blue film
- Destination: Processor
- Film orientation: Portrait
- Magnification type: Cubic
- Film size: 8 in x 10 in

At the bottom of the dialog, there are two buttons: 'Save' and 'Done'.

- Format:, Magnification type, Film size: cannot be changed with the current Senographe 2000 D release software.
- Media type: Blue film must be selected by default with Senographe 2000 D. Other choices will incur printing errors.
- Destination: Processor must be selected by default when using Senographe 2000 D. Other choices will incur printing errors.
- Film orientation: Portrait must be selected by default when using Senographe 2000 D. Other choices will incur printing errors.

### 3-4 Printing status



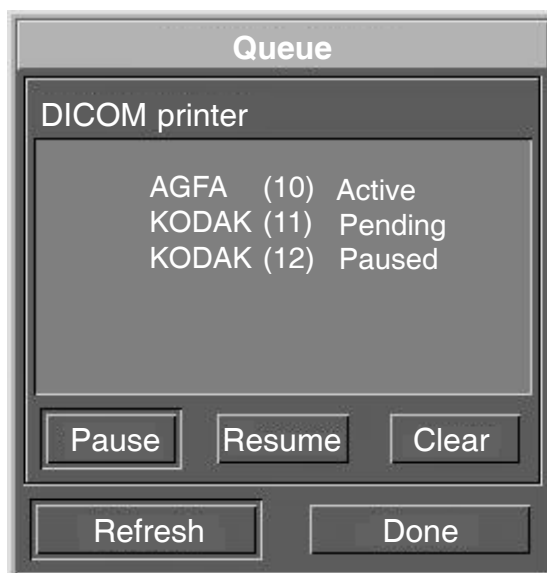
The Printing status window displays the status of the requested printing jobs. If a job shows the (OK) comment, then the exam has successfully been sent to printing.

If the job shows the (ABORTED) comment, then this means that the job has been aborted manually by the user, from the menu window buttons.

### 3-5 Filming Queue

This window is accessed from the *Print Request* window, or from the Printing status window by clicking the *Queue* button.

It displays a list of jobs in the print Queue, allowing the user to check that print jobs have been successfully sent to the printer (note that a local printer problem can prevent a job from being printed, even if it is successfully sent to the printer). If any communication problems are observed with the printer or network, the user is able to Refresh/Pause/Resume/Clear jobs listed in the Queue.



### 3-6 Print Annotation Models

When printing images to film, three models of annotation layout are available. They differ in the position and type of annotation information to be printed.

Select the model to be used in the Medical Application Preferences <Annotations> panel (see Chapter 7).

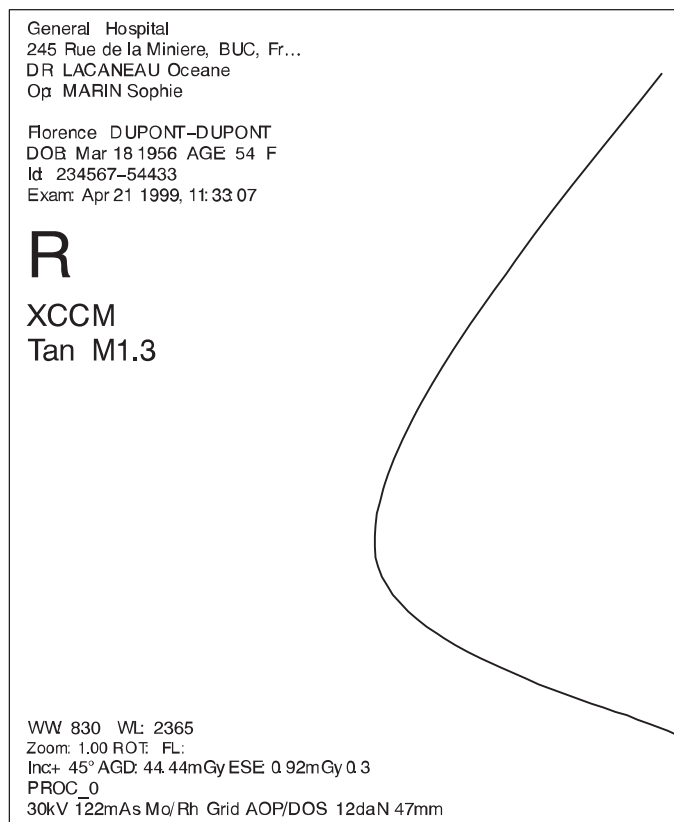
The illustrations below show the three models. In each case the model is illustrated by a view with the chest wall to the right:

#### **Model 1:**

*Institution, physician, and patient data at top, followed by view data.*

*Image and exposure data at bottom.*

*Top and bottom annotation areas are aligned to the border opposite the chest wall.*

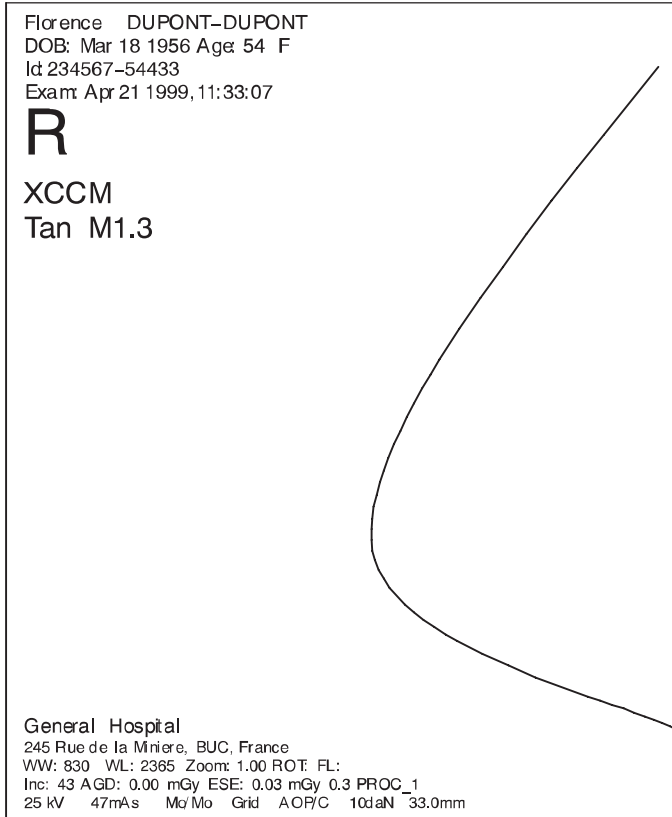


**Model 2:**

*Patient data at top, followed by view data.*

*Institution, image and exposure data at bottom.*

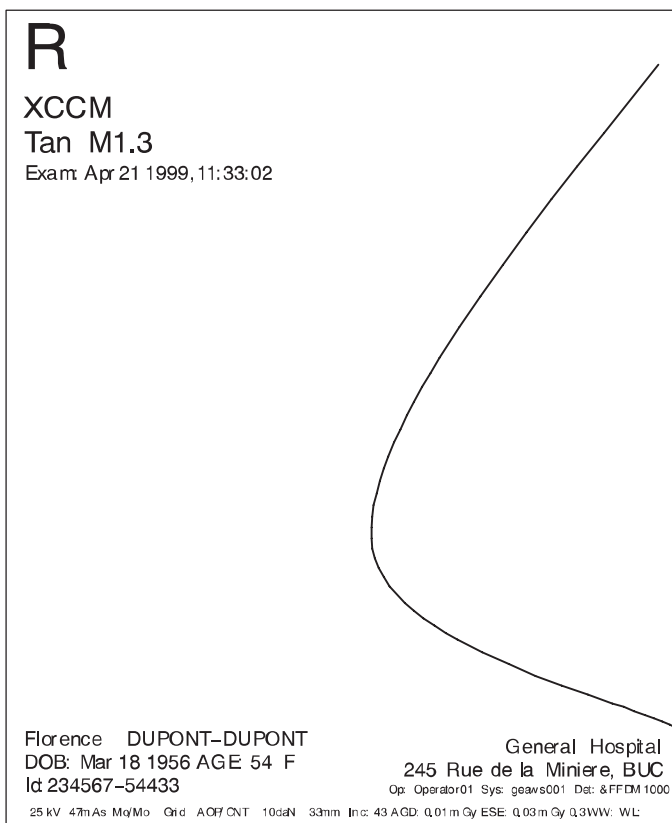
*Top and bottom annotation areas are aligned to the border opposite the chest wall.*

**Model 3:**

*View data at top, followed by exposure date and time.*

*Patient data at bottom left, institution data at bottom right, followed by exposure data.*

*The top annotation area is aligned to the border opposite the chest wall. All bottom annotations are restricted to the image footer so as to avoid overlap with the image.*



Blank page.

## CHAPTER 12 – INTERCHANGE MEDIA

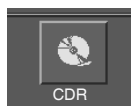
### 1. OVERVIEW

The Interchange Media option provides a compact disk recording (CD-R) drive, installed inside the Acquisition Workstation cart. It allows you to save and restore Senographe 2000 D image data using standard 5-1/4" recordable compact disks (DICOM data format). Images saved in this way may, for example, be passed to another radiologist for a second opinion.



**The Interchange Media option is NOT recommended for permanent archiving. GE does not guarantee the suitability of the media for such purposes.**

The presence of the CD-R option is indicated by icons in the Browser window:



- An icon appears in the Network panel of the Browser window (upper left corner).



- An icon appears below each of the lists in the Browser window (these icons may be turned off and on in the Browser preferences window, accessed through the Tools menu, see Chapter 7).

### 2. USING THE INTERCHANGE MEDIA OPTION

Recordable CDs are considerably more sensitive to damage than the conventional CD-ROMs that you may be familiar with. Respect the handling instructions below.

#### 2-1 Handling CD-R Media



**To avoid image loss, never touch the recordable surface of a recordable CD (CD-R). Handle the disk only by the outer edge. Do not place it face down on a hard surface. Fingerprints or scratches will make the disk unusable. Before usage, verify that CD-R surface has no visible scratches. If there are any scratches, do NOT use the CD-R.**

- Store the disk in its protective case. Proper storage helps protect the data from damage due to scratches on the disk surface.
- Do not leave the disk in direct sunlight or in a hot, humid environment. These conditions can warp and damage the disk.
- Use only a felt tip permanent pen when labeling. Write only on the printed area or on the clear inner diameter of the disk. Never use a ballpoint or hard point writing tool as it may damage the disk. Do not use adhesive labels.
- Use a soft, lint-free cloth to remove spots, dust, or fingerprints from the disk. Always wipe from the center to the outside edge of the disk. Never wipe the disk in a circular motion.
- Do not use any chemical-based cleaners. These can damage the disk.

## 2-2 Saving Images on Recordable CD

**Note:** We recommend the use of Senographe 2000 D-compatible CD-R media that have been officially validated for performance and reliability of patient data interchange on the Senographe 2000 D system. These are identified by GE labeling. GE cannot take responsibility for any data loss or incompatibility with other systems resulting from the use of media not supported by Senographe 2000 D.  
To order Senographe 2000 D-compatible media, contact your local sales representative.

A recordable CD (CD-R) can only be recorded once.  
When saving image data on a CD-R, you must always use a BLANK CD-R.

### 2-2-1 Procedure

All image data that you want to save on a given CD-R **must** be selected beforehand, and will be saved in a single pass. It is not possible to **add** data on a CD-R.

- Push the eject button under the tray on the CD-R drive. When the tray opens insert a new (blank) recordable CD into the CD-R drive (see section 2-1 on how to handle recordable CDs) and close the drive by pushing the button again. Wait for 40 seconds for the CD-R drive to be ready (when light on CD-R drive stops blinking).
- On the Browser, select the patient or patients to be saved in the same manner as selecting images for review (click on the required patient name in the browser list; to select multiple patients, hold down the CTRL key and click successively on each required patient name).

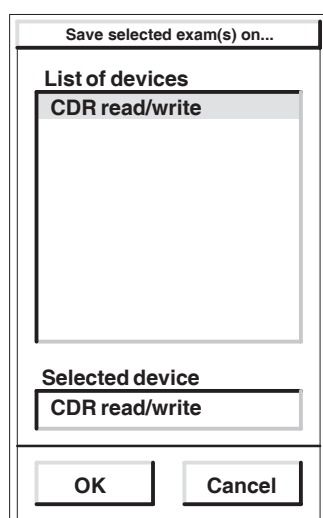


- Use the middle mouse button to drag the selected patient(s) to the **[CD-R]** icon in the Network panel



OR:

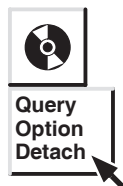
Click on the **(Push)** button below the patient list on the Browser (if the icon is not present, it may be turned on by accessing Browser preferences from the Tools menu). A window opens to show a list of available recording devices.



Select the CD-R read/write device by clicking on its name in the displayed list, then click on **(OK)**. If the Preview of CD-R content option has been set (see below) a list of the data to be recorded on the CD-R is displayed.

After about 15 minutes a message is displayed, indicating how much of the CD-R capacity will be used.

Click on **(Write)** to start the operation, or on **(Cancel)** to cancel it.



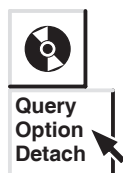
**Note:** While selecting items (before you start the save), the operation can be abandoned by clicking on the **[CD-R]** icon and selecting **[Detach]** in the drop-down menu. This stops the operation. The CD is ejected automatically and can be used again.

### 2-2-2 Preview option

The *Preview of CD-R content* option automatically displays a list of the data to be recorded on the CD-R after clicking on the **(OK)** button or after using “drag-and-drop” to start recording, but *before* saving starts. The estimated time needed to write the data to the CD-R is also shown.

At this stage, you can still cancel the save operation and modify your selection if required.

If you have not set the *Preview of CD-R content* option, saving starts immediately after clicking on the **(Save)** button, or after using “drag-and-drop”.



- To set this option on or off, click on the **(CD-R)** icon in the Network/Archive panel on the main Browser and select **[Option]** in the drop-down menu.

### 2-2-3 Checking the CD-R

You are recommended to check for successful completion by browsing the CD-R at the end of the save operation.

- To do so, click the **(CD-R)** icon on the main Browser, then select **[Query]** in the drop-down menu. If all the patients selected for the save operation are not displayed on the Media Browser, an error has occurred while recording the CD, and you will have to repeat the save operation.
- An error message appears next to the patient name if the associated information has not been saved. If this occurs:
  - Make a list of the patients correctly saved and those with an error.
  - Insert a new CD-R and repeat the save process.
  - If there are still errors, consult GE Service.

### 2-2-4 Availability of system while writing to CD-R

No other operation can be performed on the system while saving images on a CD-R. For a full CD-R the save operation can take up to 45 minutes. If the system is required for image acquisition, the save operation can be abandoned:

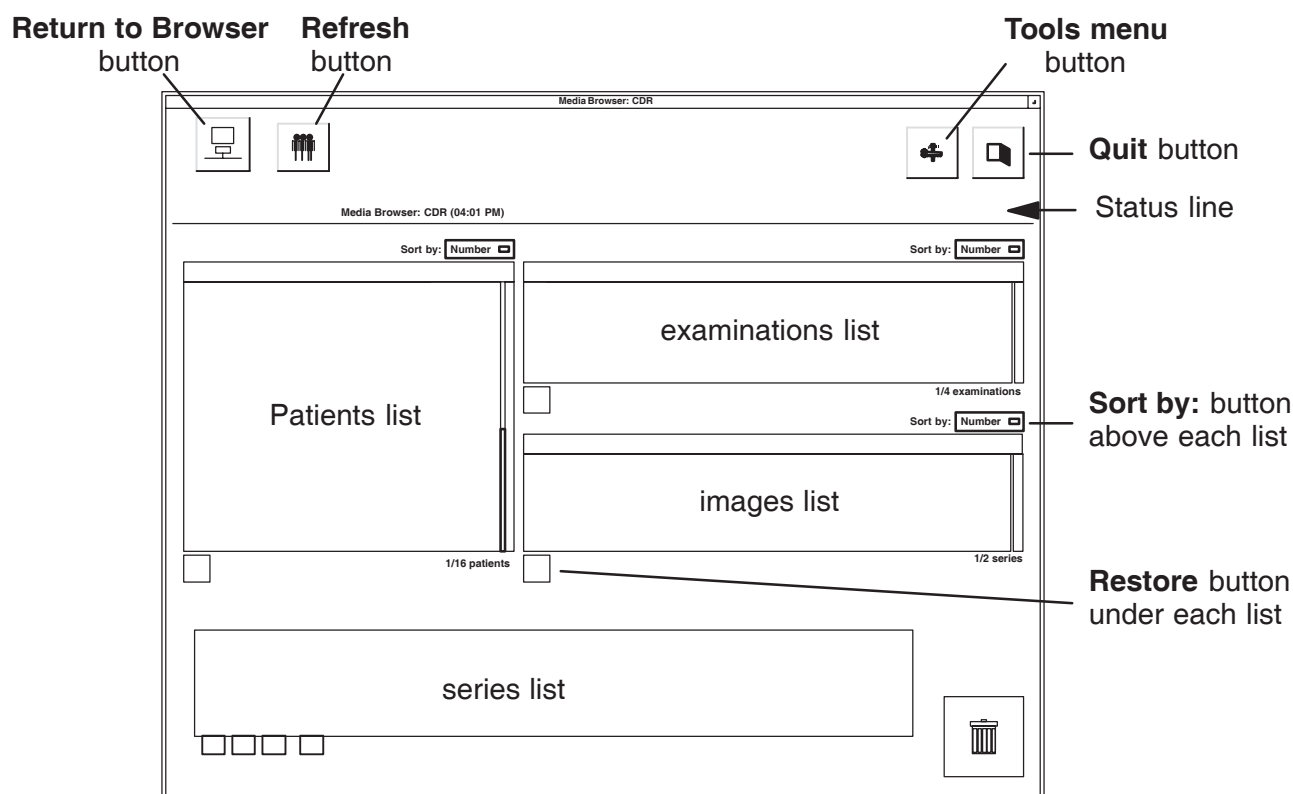
- Enter the Worklist in the usual way and request a new exam.
- A message is displayed asking if the write operation should be aborted. Answer (Yes) or (Cancel).
- If you choose (Yes), the write operation is abandoned, and the AWS application restarts. You must wait for completion of the restart process and then repeat the request for the new exam. Note that the partially written CD-R is not useable.

## 2-3 Restoring Images from Recordable CD

You can restore and review Senographe 2000 D images from 5-1/4" recordable CDs that were recorded either on the same or on another Senographe 2000 D system.

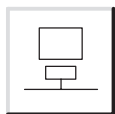
### 2-3-1 Procedure

- Check that there is enough room on your image disk to accommodate the images being restored (used disk space display on the main Browser).
- Insert the CD containing the images into the CD-R drive (see section 2-1 for handling precautions).
- Click on the **(CD-R)** icon in the Network panel on the main Browser and select **[Query]** in the drop-down menu to open the Media Browser:



- In the Media Browser:, select the patient(s) and/or exam(s) to be restored in the same manner as on the main Browser (see Chapter 7 *Browser*).
- Sort the lists as required using the **(Sort by:)** buttons.
- After selecting the desired patient, exam, series or image item(s):  
With the cursor on the selection, press and hold the middle mouse button and drag the selection directly onto the **(Return to Browser)** button at top left.  
OR  
Click on the corresponding **(Restore)** button (if the icon is not present, it may be turned on by accessing Browser Preferences from the Tools menu).





- The selected items are copied from the CD-R to the workstation database.
- Click on the **(Return to Browser)** button to return to the main Browser.
  - See section 2-4 on how to eject the CD from the CD-R drive after the restore operation.

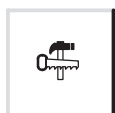
**Note:** During the restore, no other operations are possible on the Workstation.

When a patient name already exists in the Workstation database, any exams being restored from the CD for that patient are appended to the existing exams.

### 2-3-2 Notes



The contents of the Media Browser: are up-to-date when the Media Browser: is first opened. However, changes (such as after a save operation) are not displayed automatically. Click on the **(Refresh)** button to update the Browser lists. The time of the latest refresh is displayed on the status line.



The Media Browser: **Tools menu** contains the **[Application management]** menu item. This item is for use of GE Service only.

The Main Browser and Media Browser: display the same columns of information in the Patients, examinations, series and images lists. However, some of these columns may be empty in the Media Browser:r. The full information will be displayed in the Main Browser after the images have been restored.

### 2-3-3 Errors

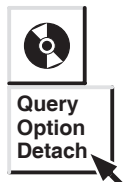
If a problem occurs, an error message is displayed:

- The following message may be displayed during preparation for saving files and needs specific action:  
*Save selection exceeds CD capacity. Save aborted*  
*Explanation:* You have selected more patient files than can be stored on a single CD.  
*Action:* Select fewer patients to be saved on the CD.  
 If this message appears with only a single patient selected, you must delete some of the exams for this patient before you can archive the patient.
- If a problem occurs during the save process, the error message *Save failed* is displayed. First check that the CD-R drive is switched on, the blank recordable CD is correctly inserted in the CD-R tray, and the tray is fully closed.  
 If the items above are correct, an error has occurred while recording the CD, and you will have to repeat the save operation using a new blank CD.
- When restoring files, the operation is halted if there is not enough space on the Workstation disk to restore the selected items (patients or exams). You can repeat the operation after freeing Workstation disk space by deleting some patients that have already been saved.

## 2-4 Ejecting a Disk from the CD-R Drive

As soon as the CD-R drive has been accessed for a save or restore operation, it is locked, and you can no longer eject the disk by means of the eject button on the front of the drive.

You must first perform a “Detach” operation:



- Click on the storage device icon in the Main Browser and select **[Detach]** in the drop-down menu.
- If the disk is not ejected automatically, press the eject button.

If **[Detach]** is displayed in grey and no save or restore operation is in progress, the archive device is already unlocked. Press the eject button to open the drive.

If a fault occurs (for example trying to start a restore operation with a blank disk in the drive), the “Detach” operation is performed automatically, and the disk is ejected.



**NEVER press the Open/Close button on the CD-R drive while a Save or restore operation is in progress.**

## CHAPTER 13 – MAINTENANCE

### 1. CLEANING AND DISINFECTION

#### 1-1 Monitor cleaning instructions

It is important that monitors used for viewing mammographic images be kept clean and free of fingerprints, dust, etc.

These instructions are applicable to LCD and CRT monitors.

Use a microfiber cloth to clean the monitor screen and housing. If necessary, moisten the cloth with either clean water or ethyl alcohol (up to 96%). Do not allow any drops of cleaning liquid to remain on the surface; extended contact may cause discoloration of the surface.

**NOTICE**

Do not use isopropyl (“rubbing”) alcohol.  
Do not use cleaning agents which may attack the surface, such as petroleum (mineral) spirits.

The front panel is extremely sensitive to mechanical damage. Avoid all scratches, knocks, etc.

Do not apply the cleaning liquid directly to the monitor housing or screen.  
Do not allow the cleaning liquid to enter the monitor housing; be sure to dampen the cloth sparingly.

#### 1-2 General Information about disinfection



**Adequate cleaning and disinfection is necessary to prevent disease transmission. Be sure to thoroughly clean and disinfect equipment surfaces that contact the patient and all equipment surfaces likely to become soiled during use.**

The level of disinfection required for a patient contact device depends on the type of contact that occurs:

- A **CRITICAL** device is one which routinely penetrates the skin or mucous membranes during use and therefore poses a high risk of infection if it is not sterile. Such devices (e.g., surgical instruments, needles, catheters or infusion sets) must be made **sterile** prior to use.
- A **SEMI-CRITICAL** device is one which contacts mucous membranes but does not penetrate normally sterile areas of the body. Such devices (e.g., endoscopes, speculum) should be made sterile whenever practical, but **high level disinfection** is usually acceptable prior to use.
- A **NON-CRITICAL** device is one which contacts intact skin during routine use. Such devices (e.g., patient exam tables, blood pressure cuff, etc.) present a much lower risk of infection and, therefore, a **low level disinfection** is usually acceptable. However, in cases when there is concern for cross contamination, an **intermediate level disinfection** should be done between patients.

The patient contact surfaces of mammography equipment are noncritical, and either low level or intermediate level disinfection is adequate for routine use. These surfaces are the bucky/Image Receptor, compression paddles and magnification platform. Other surfaces, such as the face shield, that may have casual contact with the patient and should be considered for intermediate level disinfection are



**Improper cleaning methods or the use of certain cleaning and disinfecting agents can damage the equipment, cause poor imaging performance or increase the risk of electric shock.**

**To avoid possible injury or equipment damage:**

- Do not use harsh detergents, abrasive cleaners, high alcohol concentration or Methanol at any concentration. If skin preparations contain high alcohol concentrations, allow sufficient drying time before applying compression.
- Do not expose equipment parts to steam or high temperature sterilization.
- Never allow liquids to enter the internal parts of the equipment. Do not apply cleaning sprays or liquids directly to the equipment; always use a clean cloth dampened with the spray or liquid. If you become aware of liquid entry, disconnect the electrical supply and have the equipment checked by qualified service personnel before returning it to use.

### 1-3 Cleaning Instructions

Patient contact surfaces should be washed with mild soap in lukewarm water. Removable parts that do not contain electrical components, such as the compression paddles, may be removed from the equipment and immersed if needed. Equipment parts such as the Bucky/Image Receptor that enclose electrical components must not be immersed but rather cleaned with a soft dampened cloth, taking care not to allow liquids to enter the equipment. Surfaces should be scrubbed as needed using a soft sponge, gauze or cloth to remove all visible residue. Scrubbing with a soft bristle brush (such as a toothbrush) may be necessary to reach corners or to remove material that has dried onto the surface. Subsequent disinfection may not be effective if the surfaces are not thoroughly clean.

Rinse all surfaces with clean water to remove visible soap residue, taking care to avoid liquid entry to internal equipment parts. Dry surfaces with a soft cloth to remove any visible residue.

### 1-4 Low Level or Intermediate Level Disinfection

Patient contact surfaces may be disinfected with a suitable liquid chemical germicide. Surfaces must first be cleaned of all visible contamination (see above). The liquid germicide must have a minimum contact time with the surface to be effective. Equipment parts should be wiped with a wet cloth or sponge as directed by the instructions for use provided with the germicide. If needed, removable parts not containing electrical components (compression paddles and magnification platform) can be removed and immersed. Further rinsing or wiping with clear water and drying with a soft cloth should be done to remove any germicide residue that may remain. Take care to avoid liquid entry to internal equipment parts.

## 1-5 High Level Disinfection

In the event that you feel a high level disinfection is necessary due to equipment contact with broken skin, or being used with infected or immune compromised patients, the same patient contact surfaces may be high level disinfected with a liquid chemical germicide rated for high level disinfection. The same process used as that for intermediate level disinfection is generally followed; however, the time of contact is usually much longer for high level disinfection.

## 1-6 RECOMMENDED GERMICIDES

The following legally marked products have been used on GE equipment without causing equipment damage.



**Always follow the germicide manufacturer's instructions and precautions for mixing, storage, method of application, contact time, rinsing requirements, protective clothing, shelf life and disposal to help assure effective and safe use of the product.**

### 1-6-1 Low or Intermediate Disinfection

**VESPHENE IIse**, manufactured by Calgon Vestal Laboratories, St. Louis, MO, U.S.A., EPA Reg. No. 1043-87 (510(k) K931573)

According to the manufacturer, when used according to the manufacturers instructions, this product is effective against:

- Acinetobacter calcoaceticus, ATCC 19606
- Candida albicans, clinical isolate
- Candida parapsilosis, clinical isolate
- Citrobacter freundii, ATCC 8090
- Enterobacter aerogenes, ATCC 13048
- Enterobacter cloacae, ATCC 23355
- Escherichia coli, ATCC 25922
- Klebsiella pneumoniae, ATCC 13883
- Proteus mirabilis, clinical isolate
- Proteus vulgaris, ATCC 13315
- Pseudomonas aeruginosa, ATCC 15442
- Pseudomonas aeruginosa, ATCC 27853
- Salmonella choleraesuis, ATCC 10708
- Salmonella typhi, ATCC 6539
- Salmonella typhimurium, ATCC 14028
- Serratia marcescens, ATCC 8100
- Shigella flexneri, ATCC 12022
- Shigella sonnei, ATCC 25931
- Staphylococcus aureus, ATC 6538
- Staphylococcus aureus, ATCC 25923
- Staphylococcus aureus (MRSA), Multiply Methicillin resistant clinical isolate
- Staphylococcus epidermidis, ATCC 12228

Streptococcus faecalis, ATCC 19433  
Streptococcus pyogenes, ATCC 19615  
Trichophyton mentagrophytes  
Mycobacterium tuberculosis var. bovis  
Influenza A<sub>2</sub> Japan  
Herpes simplex type 2  
vaccinia  
adenovirus type 2  
HIV-1 (AIDS) virus

**LpHse**, manufactured by Calgon Vestal Laboratories, St. Louis, MO, U.S.A., EPA Reg. No. 1043-92 (510(k) K931342)

According to the manufacturer, when used according to the manufacturer's instructions, this product is effective against all of the above, with the exception of *Salmonella choleraesuis*.

### 1-6-2 High Level Disinfection

**CIDEX**, manufactured by Johnson & Johnson Medical, Inc., Arlington, TX, U.S.A., EPA Reg. No. 7078-1, EPA Est. No. 36126-PR-1 (510(k) K924434)



**CIDEX (A CLEANING SOLUTION) CONTAINS GLUTARALDEHYDE. DIRECT CONTACT IS CORROSIVE TO EXPOSED TISSUE, CAUSING EYE DAMAGE AND SKIN IRRITATION/DAMAGE. DO NOT GET INTO EYES, ON SKIN OR ON CLOTHING. USE IN WELL VENTILATED AREA IN CLOSED CONTAINERS.**

## 2. RECOMMENDED PLANNED MAINTENANCE

To ensure safe and effective operation of the equipment, planned maintenance procedures should be carried out at the intervals specified.

### 2-1 Planned maintenance performed by the Radiologic Technologist

This consists of simple Quality Control (QC) tests which ensure that the system is operating to its design standards.

Frequency: from daily to semi-annually, depending on the task.

Procedures: please refer to the Senographe 2000 D QC Manual.

### 2-2 Planned maintenance performed by the Medical Physicist

This consists of QC tests performed by the Medical Physicist to ensure that the system provides a high level of mammographic quality.

Frequency: annually.

Procedures: please refer to the Senographe 2000 D QC Manual.

### 2-3 Planned maintenance performed by the Field Service Engineer

Planned maintenance (PM) should be performed twice a year by a GEMS Service Representative or similarly qualified and trained personnel.

A complete day is necessary on each occasion. The procedures and their frequency are listed below.

| Task                                     | Interval (months) |
|------------------------------------------|-------------------|
| <b>On-site preliminary:</b>              |                   |
| Analyze system logs                      | 6                 |
| Acquisition Backup                       | 12                |
| <b>Inspection and functional checks:</b> |                   |
| Check Emergency Stop Buttons             | 12                |
| Check Cable Grounding                    | 24                |
| Inspect Radiation Shield                 | 24                |
| Check power-Off/On Sequences             | 12                |
| <b>Generator checks and calibration:</b> |                   |
| Check Generator Calibration              | 12                |
| Check HV unit                            | 12                |
| Check the Half-Value layer Measurement   | 12                |
| Check kVp settings                       | 12                |
| Check mA and mAs settings                | 12                |
| Change Generator CPU battery             | 36                |
| Clean Conditioner air filter             | 12                |

| Task                                          | Interval (months) |
|-----------------------------------------------|-------------------|
| Check/top up Conditioner coolant              | 6                 |
| <b>Gantry checks and calibration:</b>         |                   |
| Check tube tilt and connections               | 12                |
| Check column mechanism                        | 12                |
| Check Arm Rotation                            | 12                |
| Check Light Centering Device                  | 12                |
| Check Format Control                          | 12                |
| Check Magnification Sensors                   | 12                |
| Check Tube Housing Arm Detents                | 12                |
| Check compression                             | 12                |
| Check Breast Thickness Measurement            | 6                 |
| Check Grid Presence Sensor                    | 12                |
| Change Gantry CPU battery                     | 36                |
| Check light beam centering                    | 24                |
| <b>Control Station – UPS:</b>                 |                   |
| Check UPS function                            | 6                 |
| Recalibrate UPS battery capacity              | 12                |
| <b>Acquisition IQ:</b>                        |                   |
| Perform IQ Tools Flat Field Test              | 6                 |
| Perform Image Acquisition and ACR Score check | 6                 |
| Calibrate mAs non-linearity                   | 6                 |
| Check Acquisition in AOP Mode                 | 6                 |

## CHAPTER 14 – ERROR MESSAGES

### 1. ERROR MESSAGES

Any operational anomalies found by the system during Senographe 2000 D operation are signalled by *Error Messages*. These may be displayed on the Column Readout and on the Control Console or in a pop-up box on the AWS screen. They may be simple information messages requiring no action, or they may indicate error or fault conditions requiring action from the operator and/or GEMS Service engineers.

Note that messages displayed on the Gantry begin with three identification characters, which are followed by the message itself. On the Control Console, the message is followed by seven further identification characters. Thus, for example, the Column Readout might display **I76 FAILURE** while the Control Console displays **I76 SENSOR FAILURE 158/011**. If it necessary to call GEMS Field Service about an error, you should quote the entire message, complete with the identification characters.

The tables below list error messages which may occur, with explanations and recommended actions.

**Table 1 lists error messages displayed on the Gantry: control console and/or column.**

Source of the message is mentioned:

GAN = issued from Gantry, GEN = from generator, AWS = from Acquisition workstation.

**Table 2 lists error messages displayed on the AWS screen.**

**Table 1 – Error Messages displayed on the Gantry**

| Msg. No. | Source | Message on Column Readout | Message on Control Console | Explanation                                           | Corrective Action                                                                                              |
|----------|--------|---------------------------|----------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| E 01     | GEN    | None                      | Generator failure          | Problem reported in HV section of generator.          | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service. |
| E02      | GEN    | None                      | Focus bias failure         | Problem reported in tube focus bias circuits.         | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service. |
| E03      | GEN    | None                      | Rotor failure              | Problem reported in anode starter.                    | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service. |
| E04      | GEN    | None                      | Arm fatal failure          | Generator detects error in dialog with arm.           | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service. |
| E05      | GEN    | None                      | Failure during exposure    | Current exposure aborted due to failure in equipment. | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and inform GEMS Field Service.  |

| Msg. No. | Source | Message on Column Readout | Message on Control Console  | Explanation                                           | Corrective Action                                                                                                                                              |
|----------|--------|---------------------------|-----------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E06      | GEN    | None                      | Software error (gen CPU)    | An error occurred in the Generator CPU software.      | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and inform GEMS Field Service.                                                  |
| E08      | GEN    | None                      | Power supply failure        | Supply of generator power circuits is not authorized. | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                 |
| E10      | GEN    | None                      | Heating failure track 1     | Molybdenum focal track is unserviceable.              | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service. You can still work with rhodium focal track.    |
| E11      | GEN    | None                      | Heating failure track 2     | Rhodium focal track is unserviceable.                 | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service. You can still work with molybdenum focal track. |
| E12      | GEN    | None                      | Checksum error (gen)        | Calibration parameters have been modified.            | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                 |
| E13      | GEN    | None                      | Gen./Arm communication fail | Generator cannot communicate with arm.                | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                 |
| E14      | GEN    | None                      | Generator CPU/INTG failure  | A problem has been reported by the Generator CPU.     | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                 |
| E15      | GEN    | None                      | Console communication fail  | Generator cannot communicate with Control Console.    | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                 |

| Msg. No. | Source | Message on Column Readout | Message on Control Console   | Explanation                                                                                                                                                                                                                                                  | Corrective Action                                                                                                                                                                                                                                                                     |
|----------|--------|---------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E18      | GEN    | None                      | IDC/SENO Synchro. fail       | A problem occurs in synchronization between Image Detection Control system and generator during acquisition. May be the image will be fully acquired but in that case, dose parameters will be missed (set to 0 in the image).<br>Next exposure is inhibited | 1. Switch OFF the Gantry<br>2. Switch ON<br>3. If the problem occurs again at the next acquisition power OFF the whole system and wait for the end of the shutdown sequence.<br>4. Restart the system<br>5. If the problem persists, note ALL messages and inform GEMS Field Service. |
| E19      | GEN    | None                      | IDC/SENO down, DPS is OFF    | Image Detection Control system cannot communicate with Generator<br>The Detector Power Supply is then powered OFF by the system.                                                                                                                             | 1. Switch OFF the Gantry<br>2. Switch ON<br>3. If the problem occurs again at the next acquisition power OFF the whole system and wait for the end of the shutdown sequence.<br>4. Restart the system<br>5. If the problem persists, note ALL messages and inform GEMS Field Service. |
| E20      | GEN    | None                      | Check Main Distribution Rack | Supply of AWS Cart and Detector environment circuits is not authorized.                                                                                                                                                                                      | 1. Switch OFF the Gantry<br>2. Switch ON<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                                                                              |
| E21      | GEN    | None                      | Detector supply not supplied | Supply of Detector circuits is not authorized.                                                                                                                                                                                                               | 1. Switch OFF the Gantry<br>2. Switch ON<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                                                                              |
| E22      | GEN    | None                      | Conditioner not supplied     | Supply of detector Conditioner circuits is not authorized.                                                                                                                                                                                                   | 1. Switch OFF the Gantry<br>2. Switch ON<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                                                                              |
| E23      | GEN    | None                      | AWS cart not supplied        | Supply of WS Cart circuits is not authorized.                                                                                                                                                                                                                | 1. Switch OFF the Gantry<br>2. Switch ON<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                                                                              |

| Msg. No. | Source | Message on Column Readout | Message on Control Console       | Explanation                                                                                                                                    | Corrective Action                                                                                                                                                                                                                                                                                                       |
|----------|--------|---------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E24      | GEN    | None                      | Failure before exposure          | Current image acquisition aborted before exposure due to failure in the equipment                                                              | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                                                                          |
| E25      | GEN    | None                      | AWS/SENO Synchro. fail           | A problem occurs in synchronization between AWS system and generator during acquisition.<br>Next exposure is inhibited                         | 1. Switch OFF the whole system and wait for the end of the shutdown sequence<br>2. Restart the system<br>4. If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                                                   |
| E26      | GEN    | None                      | AWS/SENO comm. failure           | AWS system cannot communicate with Generator.                                                                                                  | 1. Switch OFF the Gantry<br>2. Switch ON<br>3. If the problem occurs again at the next acquisition power OFF the whole system and wait for the end of the shutdown sequence.<br>4. Restart the system<br>5. If the problem persists, note ALL messages and inform GEMS Field Service.                                   |
| E35      | GEN    | None                      | SYSTEM SHUTDOWN STARTED          | A power OFF of the whole system has been started.<br>The generator will power off the supply of Detector, Gantry and Generator in few minutes. | Stop system usage and wait the end of the shutdown sequence.                                                                                                                                                                                                                                                            |
| E36      | GEN    | None                      | CART PWR FAILURE – SYST SHUTDOWN | The system shutdown has been processed because an UPS error has been detected or communication with UPS has been lost.                         | 1. Stop system usage and wait the end of the shutdown sequence.<br>2. Check the main power supply.<br>3. Check (on UPS panel) that the batteries are charging. Do not attempt to restart the system until the batteries have recharged.<br>4. If the problem persists, note ALL messages and inform GEMS Field Service. |
| E50      | GAN    | Failure                   | Software Failure                 | Gantry software error.                                                                                                                         | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and error codes (ESPECIALLY THE 6 DIGITS OF E50 MESSAGES) and contact GEMS Field Service.                                                                                                                                                |

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| Msg. No. | Source | Message on Column Readout | Message on Control Console | Explanation                                                                                                           | Corrective Action                                                                                                                                                                         |
|----------|--------|---------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E51      | GAN    | Collim. Fail              | Lateral Collimator Failure | A problem has been reported in the lateral collimator, so correct format cannot be ensured.<br>Exposure is inhibited. | Switch OFF Gantry, then switch ON.<br>If the problem continues, note ALL messages and contact GEMS Field Service.                                                                         |
| E53      | GAN    | Collim. Fail              | Rear Collimator Failure    | A problem has been reported in the rear collimator, so correct format cannot be ensured.<br>Exposure is inhibited.    | Switch OFF Gantry, then switch ON.<br>If the problem continues, note ALL messages and contact GEMS Field Service.                                                                         |
| E54      | GAN    | Failure                   | Gantry Electronic Failure  | A problem has been reported by the Gantry.                                                                            | Switch OFF Gantry, then switch ON.<br>If the problem continues, note ALL messages and contact GEMS Field Service.                                                                         |
| E55      | GAN    | Housing Fail              | Housing Angulation Failure | A problem has been reported in tube housing angular shift.                                                            | Switch OFF Gantry, then switch ON.<br>If the problem continues, note ALL messages and contact GEMS Field Service.                                                                         |
| E58      | GAN    | Collim. Fail              | Front Collimator Failure   | A problem has been reported in the Front collimator blade, so correct format cannot be ensured.                       | Switch OFF Gantry, then switch ON.<br>If the problem continues, note ALL messages and contact GEMS Field Service.                                                                         |
| E64      | GAN    | Filter Fail               | Filter Positioning Failure | A filter rotation problem has been reported, so good filter positioning is not ensured.<br>Exposure is inhibited.     | Switch OFF Gantry, then switch ON.<br>If the problem continues, note ALL messages and contact GEMS Field Service.                                                                         |
| E71      | GAN    | Bucky Fail                | Bucky Failure              | Bucky cannot be moved under normal conditions.                                                                        | 1. Remove Bucky.<br>2. Reinstall Bucky.<br>3. Make a Rad Prep.<br>4. If failure continues, note ALL messages, and contact GEMS Field Service.<br>Exposures can be made without the Bucky. |
| E76      | GAN    | Ang. Failure              | Angle Sensor Failure       | Fault in Gantry angle sensor.                                                                                         | Switch OFF Gantry, then switch ON.<br>If the problem continues, note ALL messages and contact GEMS Field Service.                                                                         |

| Msg. No. | Source | Message on Column Readout | Message on Control Console       | Explanation                                                                                               | Corrective Action                                                                                                                                                                                                                                                                                                        |
|----------|--------|---------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E86      | GAN    | Chksum Error              | Arm checksum error               | Content of saved memory has been modified. Calibration may be false. Compression is inhibited.            | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                                                                           |
| I05      | GEN    | None                      | Exposure aborted by mAs level    | Exposure aborted because not enough mAs available to continue exposure.                                   | 1. Press RESET.<br>2. Reposition the patient.<br>3. Start exam again<br>4. If the problem continues, note ALL messages and contact GEMS Field Service.<br>5. Nevertheless, you can continue to use the system with manual acquisition.                                                                                   |
| I06      | GEN    | None                      | Abort: Detect sig. out range     | Exposure aborted because brightness received by detector are not in range to continue exposure.           | 1. Press RESET.<br>2. Reposition the patient.<br>3. Start acquisition again<br>4. If the problem continues, note ALL messages and contact GEMS Field Service.<br>5. Nevertheless, you can continue to use the system with manual acquisition.                                                                            |
| I07      | GEN    | None                      | Selected filter not allowed : Al | Filter selected by the operator not allowed. The Senograph automatically selects the next correct filter. | 1. Press "Filter selection" to have the correct filter selected.                                                                                                                                                                                                                                                         |
| I12      | GEN    | None                      | Maximum mAs =                    | Maximum available mAs are equal to xxx.                                                                   | Information message only. (If mAs exceeded, cell aborts exposure at 2 or 3 mAs if entire exposure cannot be made.)                                                                                                                                                                                                       |
| I13      | GEN    | None                      | IDC was not ready                | Image Detection Control system was not ready to perform an image acquisition.                             | 1. Press the prep button again.<br>2. Switch OFF the Gantry<br>3. Switch ON<br>4. If the problem occurs again at the next acquisition power OFF the whole system and wait for the end of the shutdown sequence.<br>5. Restart the system<br>6. If the problem persists, note ALL messages and inform GEMS Field Service. |

| Msg. No. | Source | Message on Column Readout | Message on Control Console | Explanation                                                                                                                                                                              | Corrective Action                                                                                                                                                                                                                                                                                                             |
|----------|--------|---------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I14      | GEN    | None                      | AWS was not ready          | AWS system was not ready to perform an image acquisition.                                                                                                                                | 1. Press the prep button again.<br>2. If the problem occurs again at the next acquisition power OFF the whole system and wait for the end of the shutdown sequence.<br>5. Restart the system<br>6. If the problem persists, note ALL messages and inform GEMS Field Service.                                                  |
| I15      | GEN    | None                      | Console locked             | The control console is locked due to service access (detector calibration or IQ tool is in progress). Actions on right-hand section of control console are still available.              | Wait end of service access.<br>If no service in progress power OFF/ON the DMR.                                                                                                                                                                                                                                                |
| I16      | GEN    | None                      | Collimator locked          | The diaphragm control is locked because detector calibration is in progress.                                                                                                             | Wait end of calibration.<br>If no calibration in progress power OFF/ON the DMR.                                                                                                                                                                                                                                               |
| I17      | GEN    | None                      | AWS/SENO comm. lost        | AWS system cannot communicate with Generator.<br>May be a service PC laptop is connected in place of AWS or may be the AWS cart is powered OFF for service need.                         | 1. Wait end of service operation if there is one else wait 1mn to allow the system to recover itself,<br>2. If the problem persists, power OFF the whole system and wait for the end of the shutdown sequence.<br>5. Restart the system<br>6. If the problem persists again, note ALL messages and inform GEMS Field Service. |
| I18      | GEN    | None                      | Collimator/Console locked  | The control console and the diaphragm control are locked due to service access (detector calibration in progress). Actions on right-hand section of control console are still available. | Wait end of service access.<br>If no service in progress power OFF/ON the DMR.                                                                                                                                                                                                                                                |

| Msg. No. | Source | Message on Column Readout | Message on Control Console   | Explanation                                                                                                                                                               | Corrective Action                                                                                                                                                                                                                                             |
|----------|--------|---------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I19      | GEN    | None                      | IDC/SENO comm. lost          | Image Detection Control system cannot communicate with Generator.<br>If the communication is not recovered in few minutes, the system will be in failure mode (error E19) | 1. Wait that the Image Detector control system finished to recover itself.                                                                                                                                                                                    |
| I21      | GEN    | None                      | Heating failure track 1      | Molybdenum focal track is out of use.                                                                                                                                     | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.<br>You can continue using rhodium focal track.                                                                                                 |
| I22      | GEN    | None                      | Heating failure track 2      | Rhodium focal track is out of use.                                                                                                                                        | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.<br>You can continue using molybdenum focal track.                                                                                              |
| I23      | GEN    | None                      | Console communication fail   | Generator-Control Console connection is faulty.                                                                                                                           | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                    |
| I24      | GEN    | None                      | Line power interruption      | Micro power cut occurred on line supply.                                                                                                                                  | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                |
| I25      | GEN    | None                      | Recumbent patient view names | Operator has selected a view name for recumbent patient.                                                                                                                  | If you don't want to run acquisition with this selected view name, enter again to the set-up/Proj. menu without valid to come back to normal view name selection.<br>Else the view name selection will come-back to normal selection after the next exposure. |
| I27      | GEN    | None                      | Generator CPU battery error  | CPU backup battery is discharged.                                                                                                                                         | Contact GEMS Field Service.<br><b>DO NOT REMOVE POWER FROM EQUIPMENT.</b>                                                                                                                                                                                     |

| Msg. No. | Source | Message on Column Readout | Message on Control Console      | Explanation                                                                                       | Corrective Action                                                                                                                                                                                                                                                         |
|----------|--------|---------------------------|---------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I28      | GEN    | None                      | Max wait for same exposure mn   | It is necessary to wait the displayed time to be able to repeat the same exposure.                | Wait the required amount of time to repeat exposure. If an exposure is attempted before this time, an abort may possibly occur (there is a safety margin to ensure proper operation). You can ignore the message if a different, less dense, breast is to be imaged next. |
| I29      | GEN    | None                      | Excessive mAs for this mode mAs | The amount of mAs necessary to repeat the same exposure is too high in the mode selected.         | Switch to a different mode or to a different filter.                                                                                                                                                                                                                      |
| I31      | GEN    | None                      | Abort: Image signal too low     |                                                                                                   |                                                                                                                                                                                                                                                                           |
| I32      | GEN    | None                      | Abort: Image signal too high    |                                                                                                   |                                                                                                                                                                                                                                                                           |
| I33      | GEN    | None                      | Abort: No AOP zone found        |                                                                                                   |                                                                                                                                                                                                                                                                           |
| I34      | GEN    | None                      | Thickness out of AOP range      |                                                                                                   |                                                                                                                                                                                                                                                                           |
| I46      | GEN    | None                      | System Setting in progress      | AWS set-up in progress (loading of Flat Field map) after a new filter was selected.               | No action required. This message is displayed for two seconds after selection of a new filter.                                                                                                                                                                            |
| I50      | GAN    | Lock Jammed               | Lock Jammed                     | LOCK PROBLEM: In spite of command, lock release does not operate.                                 | Try again to release lock. If the problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                                    |
| I51      | GAN    | Hot Lock                  | Lock Overheated                 | Lock temperature too high (used for too long period and/or too frequently)                        | Wait for lock to cool.                                                                                                                                                                                                                                                    |
| I52      | GAN    | Arm Unlocked              | Tube Housing Arm Unlocked       | Tube housing arm in unstable position because lock is badly latched.                              | Pivot arm to latch correctly. If the problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                                 |
| I54      | GAN    | Wait...                   | Power Limitation                | Heat protection for 27 V supply. Elevator, rotation, and light centering device lock are blocked. | Leave equipment idle for a while. If the problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                             |

| Msg. No. | Source | Message on Column Readout | Message on Control Console  | Explanation                                                                                                             | Corrective Action                                                                                              |
|----------|--------|---------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 156      | GAN    | Slipping                  | Compression Motor Slipping  | Compression motor has slipped and lost its position.                                                                    | 1. Release footpedal or compression button, and move paddle up to park position.<br>2. Repeat the compression. |
| 162      | GAN    | Oscillations              | Arm oscillations            | Gantry oscillate then the sensor angle value is not stable.<br>This angle variation could affect view name calculation. | 1. Wait that the gantry stabilizes.                                                                            |
| 170      | GAN    | Comp Failure              | Compression Failure         | Compression did not function correctly.                                                                                 | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.     |
| 171      | GAN    | Light Fail                | Light Centering Device Fail | The light centering device is not functioning correctly.                                                                | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.     |
| 172      | GAN    | Column Fail               | Column Motion Failure       | Elevator is not functioning correctly.                                                                                  | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.     |
| 173      | GAN    | Rotat. Fail               | Rotation Brake Failure      | Rotation brake is not functioning correctly.                                                                            | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.     |
| 174      | GAN    | Lock Failure              | Arm Lock Failure            | Arm lock is not functioning correctly.                                                                                  | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.     |
| 175      | GAN    | Button Fail               | Button Security Failure     | Problem reported in operator presence interlock in control buttons.                                                     | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.     |
| 176      | GAN    | Failure                   | Arm Sensor Failure          | An error has occurred in the rotation angle sensor.                                                                     | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.     |
| 177      | GAN    | Pedal Fail                | Comp Pedal Security Failure | The operator presence interlock for the compression pedal did not function correctly.                                   | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.     |

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NOTE: Once downloaded, this document is UNCONTROLLED, and therefore may not be the latest revision. Always confirm revision status against a validated source (ie CDL).

| Msg. No. | Source | Message on Column Readout | Message on Control Console | Explanation                                                                                  | Corrective Action                                                                                                                                                                                                                                                                                                                                     |
|----------|--------|---------------------------|----------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 178      | GAN    | Blown Fuse                | Blown Fuse                 | A fuse has failed.                                                                           | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                                                                                                            |
| 179      | GAN    | Failure                   | Power Supply Failure       | A power supply has failed.                                                                   | Switch OFF Gantry, then switch ON. If problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                                                                                                            |
| 185      | GAN    | Force < -4                | Force < - 4 kgf            |                                                                                              |                                                                                                                                                                                                                                                                                                                                                       |
| 186      | GAN    | Decompres.                | Decompression              | Compression paddle hit an obstacle during up-movement at start-up. Compression not possible. | Use the decompression pedal to raise the paddle to park position. Compression should now be possible.                                                                                                                                                                                                                                                 |
| 190      | GAN    | None                      | Auto-Decompression is Off  | The automatic decompression mode has been inhibited by the user.                             | If auto-decompress mode is wanted switch modes by changing the parameter in the Setup/Medical menu. Otherwise no action is required; this information is normally displayed.                                                                                                                                                                          |
| 198      | GAN    | Column Fault              | Column Up Impossible       | Elevator up-movement is not possible.                                                        | 1. Check if any movement switches (up/down, rotation) were pressed during power ON. If yes, release the necessary switches and restart the Gantry system.<br>2. Check if obstacle preventing up-movement.<br>3. Command down-movement.<br>4. Command up-movement.<br>5. If the problem continues, note ALL messages and contact GEMS Field Service.   |
| 199      | GAN    | Column Fault              | Column Down Impossible     | Elevator down-movement is not possible.                                                      | 1. Check if any movement switches (up/down, rotation) were pressed during power ON. If yes, release the necessary switches and restart the Gantry system.<br>2. Check if obstacle preventing down-movement.<br>3. Command up-movement.<br>4. Command down-movement.<br>5. If the problem continues, note ALL messages and contact GEMS Field Service. |

| Msg. No. | Source | Message on Column Readout | Message on Control Console         | Explanation                                                                                                            | Corrective Action                                                                                                                                                                                                                                                                      |
|----------|--------|---------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S01      | GEN    | None                      | Aborted exposure                   | Exposure in progress has been aborted because the Exposure Button was released by operator before the end of exposure. | Switch OFF Gantry, then switch ON. Start exam again.                                                                                                                                                                                                                                   |
| S02      | GEN    | None                      | Exposure aborted by HV arcing      | Exposure was aborted because more than eight x-ray tube arcing events occurred.                                        | Switch OFF Gantry, then switch ON. Start exam again.                                                                                                                                                                                                                                   |
| S05      | GEN    | None                      | Wrong selection of kV/track couple | Selected kV/focal track is not enabled (kV values are too low in the Rh focal track).                                  | Change the configuration.                                                                                                                                                                                                                                                              |
| S07      | GEN    | None                      | Exposure aborted by IDC            | in OM                                                                                                                  | 1. Switch OFF the Gantry<br>2. Switch ON<br>3. If the probleme occurs again at the next acquisition power OFF the whole system and wait for the end of the shutdown sequence.<br>4. Restart the system<br>5. If the problem persists, note ALL messages and inform GEMS Field Service. |
| S08      | GEN    | None                      | Required power is too high         | Power requested in Manual Mode is too high.                                                                            | Reduce kV or mAs values.                                                                                                                                                                                                                                                               |
| S09      | GEN    | None                      | No compression detected            | Breast is not compressed.                                                                                              | Breast compression is mandatory.                                                                                                                                                                                                                                                       |
| S10      | GEN    | None                      | Generator cooling mn               | Generator requires xxxx minutes to cool.                                                                               | Wait for cooling period (or lower mAs values in Manual Mode).                                                                                                                                                                                                                          |
| S11      | GEN    | None                      | Tube cooling mn                    | Tube requires xxxxx minutes to cool.                                                                                   | Wait for cooling to terminate (or lower mAs values in Manual Mode).                                                                                                                                                                                                                    |
| S12      | GEN    | None                      | Configuration not allowed          | Incompatible settings of magnification, grid, and focal spot have been selected.                                       | Select compatible settings (refer to the Image Acquisition chapter).                                                                                                                                                                                                                   |
| S13      | GEN    | None                      | Backup mAs < 50 exposure inhibited | Maximum mAs < 50. Exposure inhibited.                                                                                  | Wait for cooling to terminate (or lower kV values in AEC Mode).                                                                                                                                                                                                                        |

| Msg. No. | Source | Message on Column Readout | Message on Control Console    | Explanation                                                                                                                                        | Corrective Action                                                                                                                                                                                                                                                                                                                            |
|----------|--------|---------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S14      | GEN    | None                      | Maximum mAs exceeded          | Maximum mAs set at installation are exceeded. (This message appears only if a value below the maximum possible mAs value was set at installation). | Lower mAs values.                                                                                                                                                                                                                                                                                                                            |
| S20      | GEN    | None                      | Acq. Abort, image can be lost | Exposure has been fully performed but image may be lost because an error occurred in the image chain detection or processing.                      | 1. Press RESET.<br>2. check image quality if image is displayed<br>2. Reposition the patient.<br>3. Start exam again<br>2. If the problem persists, power OFF the whole system and wait for the end of the shutdown sequence.<br>5. Restart the system<br>6. If the problem persists again, note ALL messages and inform GEMS Field Service. |
| S21      | GEN    | None                      | Waiting for AWS boot          | Communication with AWS system is not yet established.                                                                                              | 1. Wait AWS boot and login is finished.<br>2. If message persists 10mn after the AWS login power OFF the whole system and wait for the end of the shutdown sequence.<br>5. Restart the system<br>6. If the problem persists again, note ALL messages and inform GEMS Field Service.                                                          |
| S22      | GEN    | None                      | Waiting for IDC boot          | Communication with Image Detection Control sysetm is not yet established.                                                                          | 1. Wait Image detection Control boot is finished.<br>2. If message persists 10mn power OFF the whole system and wait for the end of the shutdown sequence.<br>5. Restart the system<br>6. If the problem persists again, note ALL messages and inform GEMS Field Service.                                                                    |
| S23      | GEN    | None                      | Laterality is not selected    | You have not selected the laterality of the breast to perform acquisition. Exposure is inhibited                                                   | Select laterality on the Control Console. If you are imaging a test object, the laterality chosen is not important.                                                                                                                                                                                                                          |
| S25      | GEN    | None                      | Tube housing over temperature | The temperature of the tube housing is too high (> 65°C).                                                                                          | Wait for the tube housing temperature to fall.                                                                                                                                                                                                                                                                                               |

| Msg. No. | Source | Message on Column Readout | Message on Control Console           | Explanation                                                                                                                                   | Corrective Action                                                                                                                                                                                                                                                                             |
|----------|--------|---------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S26      | GEN    | None                      | Exposure too long                    | The exposure is too long (this message should appear only in manual mode).                                                                    | Increase the kV value or reduce the mAs value.                                                                                                                                                                                                                                                |
| S32      | GEN    | None                      | Compression sensor fault             | Breast thickness is badly calculated in AOP mode.<br>It is still possible to continue the exam in manual mode.                                | Switch OFF Gantry, then switch ON. If the problem continues, note ALL messages and contact GEMS Field Service.                                                                                                                                                                                |
| S33      | GEN    | None                      | Wait Until End of Digital Acquisit.  | Acquisition is inhibited until the previous image has been completely recorded.                                                               | No action is required. The display of this message is normal during image transfer to the workstation. It will be cleared when system is ready for the next acquisition.<br>If the problem persists, switch OFF gantry, then switch it ON.                                                    |
| S37      | GEN    | None                      | Exp. Abort, Wait Image Acquisition   | Exposure in progress has been aborted by the operator or the equipment but the system processed and display the image that has been generate. | 1. Look at the message displayed when the reset button is highlighted to know the real problem<br>2. Press reset and perform the action required by the last displayed message.                                                                                                               |
| S38      | GEN    | None                      | Abort by HV arcing. Wait Image Acq.  |                                                                                                                                               |                                                                                                                                                                                                                                                                                               |
| S39      | GEN    | None                      | Abort by IDC. Wait Image Acquisition |                                                                                                                                               |                                                                                                                                                                                                                                                                                               |
| S50      | GAN    | Expos Impos               | Incorrect X-Ray Incidence            | The position of the tube carrying arm does not allow exposure: – Position not locked at 0 degrees.                                            | Correct the position of the tube carrying arm.                                                                                                                                                                                                                                                |
| S81      | AWS    | None                      | S81 Image detection not ready        | One of the image detection coponent is buzy or its condition to acquire images is not yet reached.                                            | 1. Wait for completion of system setting.<br>2. If this X-ray inhibition stays displayed more that 10 mn Switch OFF the whole system and wait for the end of the shutdown sequence.<br>3. Restart the system.<br>4. If the problem persists, note ALL messages and inform GEMS Field Service. |

| Msg. No. | Source | Message on Column Readout | Message on Control Console        | Explanation                                                                                                         | Corrective Action                                                                                                                                                                                                                                                                             |
|----------|--------|---------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S82      | AWS    | None                      | S82 Image detection failure       | One of the image detection component is failed.                                                                     | 1. Switch OFF the whole system and wait for the end of the shutdown sequence.<br>2. Restart the system.<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                       |
| S83      | AWS    | None                      | S83 Detector environment not OK   | The environment of the detector is not correct to allow acquisition.                                                | 1. Wait for completion of system setting.<br>2. If this X-ray inhibition stays displayed more than 10 mn switch OFF the whole system and wait for the end of the shutdown sequence.<br>3. Restart the system.<br>4. If the problem persists, note ALL messages and inform GEMS Field Service. |
| S84      | AWS    | None                      | S84 Image quality is degraded     | The temperature drifts slowly from the optimal value specified for best Image Quality.                              | Check image quality on current exam.<br>If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                                                                                             |
| S85      | AWS    | None                      | S85 Detector environment failure  | The environment of the detector is failed.                                                                          | 1. Switch OFF the whole system and wait for the end of the shutdown sequence.<br>2. Restart the system.<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                       |
| S86      | AWS    | None                      | S86 AWS/IDC Communication lost    | AWS system cannot communicate with Image Detection control system but the communication should be recovered itself. | 1. Wait that the Image Detector control system finished to recover itself.                                                                                                                                                                                                                    |
| S87      | AWS    | None                      | S87 AWS/IDC Communication failure | AWS to Image Detection control system communication is failed.                                                      | 1. Switch OFF the whole system and wait for the end of the shutdown sequence.<br>2. Restart the system.<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                                                                                                       |

| Msg. No. | Source | Message on Column Readout | Message on Control Console            | Explanation                                                                                                              | Corrective Action                                                                                                                                                                                                                     |
|----------|--------|---------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S88      | AWS    | None                      | S88 AWS image delivery failure        | AWS image delivery to medical application default.                                                                       | 1. If this message stays displayed more than 5mn switch OFF the whole system and wait for the end of the shutdown sequence.<br>2. Restart the system.<br>3. If the problem persists, note ALL messages and inform GEMS Field Service. |
| S89      | AWS    | None                      | S89 AWS not available for acquisition | The AWS cannot allow acquisition because of lack of disk space or an uncomplete action on AWS.                           | 1. Check that all actions are complete<br>2. Increase free space on image disk by deleting exams that have been archived.<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                             |
| S90      | AWS    | None                      | S90 AWS not available, close exam     | No more AWS resources to continue exam occurs in AWS.                                                                    | 1. Close exam.<br>2. Increase free space on image disk by deleting exams that have been archived.<br>3. If the problem persists, note ALL messages and inform GEMS Field Service.                                                     |
| S91      | AWS    | None                      | S91 Need user action on AWS           | Operator input is required on AWS.                                                                                       | Answer to AWS pop-up.                                                                                                                                                                                                                 |
| S92      | AWS    | None                      | S92 AWS busy, please wait...          | The AWS is busy, and the current operation may take some time.                                                           | No action required, wait for completion of the current operation.                                                                                                                                                                     |
| S93      | AWS    | None                      | S93 AWS busy                          | The AWS is busy (the wait should be short).                                                                              | No action required, wait for completion of the current operation.                                                                                                                                                                     |
| S94      | AWS    | None                      | S94 System performing test, wait      | An application is running on the system and performs tests that should not allow acquisition (example auto-diagnostics). | Wait few minutes.                                                                                                                                                                                                                     |

| Msg. No. | Source | Message on Column Readout | Message on Control Console            | Explanation                                                                                                                                                                                                           | Corrective Action                                         |
|----------|--------|---------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| S95      | AWS    | None                      | S95 Medical Application not active    | AWS has not yet entered application mode. This message is always displayed after system boot and after each close exam even during review. In fact it is displayed because no application are ready to get the image. | Start a new exam or QAP acquisition.                      |
| S96      | AWS    | None                      | S96 System activity conflict          | A diagnostic or calibration application runs while the medical application is active.                                                                                                                                 | Check if several application is running if yes close one. |
| S97      | AWS    | None                      | S97 AWS reset in progress, wait       | The AWS is completing a reset operation.                                                                                                                                                                              | No action required, wait for completion of the reset.     |
| S98      | AWS    | None                      | S98 Exp. inhibited CAL/IQ in progress | The current application is CALtool or IQtool. No exposure is requested by this application.                                                                                                                           | No action required.                                       |
| S99      | AWS    | None                      | S99 OFFSET ACQUISITION IN PROGRESS    | The current application is CALtool or IQtool. Offset acquisition has started.                                                                                                                                         | No action required.                                       |
| S100     | AWS    | None                      | S100 PLEASE WAIT ...                  | AWS is being reconfigured. The message is displayed until reconfiguration is complete.                                                                                                                                | No action required.                                       |

Table 2 – Error messages displayed on the AWS monitor

| Message on AWS screen                                   |                                                        | Explanation                                                                                                                                                                                                                         | Corrective action                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AA</b> These messages relate to power on/off events: |                                                        |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                    |
| AA 1                                                    | Could not connect to the remote provider               | The specified remote host could not be found. It may be temporarily off-line, its address may have changed or been incorrectly entered, the application on the remote provider may not be running, or there may be a network error. | 1. Try again after a short wait.<br>2. If the message is repeated, check that the server address is correct and that the remote application is running.<br>3. If the problem persists, contact GEMS Field Service.                                                                                                 |
| AA 2                                                    | Do you really want to power off the system: yes or no? | This message is displayed as part of the normal shutdown sequence.                                                                                                                                                                  | No corrective action required (click <b>Yes</b> or <b>No</b> as required)                                                                                                                                                                                                                                          |
| AA 3                                                    | "End of remote connection in progress"                 | A GE Insite connection is being closed.                                                                                                                                                                                             | No action is required; you can now use the system.                                                                                                                                                                                                                                                                 |
| AA 4                                                    | "Image detection failure, exam forbidden"              | An image detection subsystem is not ready for acquisition after start-up.                                                                                                                                                           | 1. Wait to see if the problem clears.<br>2. If the problem persists, contact GEMS Field Service.                                                                                                                                                                                                                   |
| AA 5                                                    | "Initialization not complete, please wait"             | A system initialization process is in progress.                                                                                                                                                                                     | Wait until system initialization is complete.                                                                                                                                                                                                                                                                      |
| AA 6                                                    | "No Ups Power Backup"                                  | A UPS error has been detected or communication with the UPS has been lost.                                                                                                                                                          | 1. Stop system usage and shut down the system.<br>2. Check the mains power supply.<br>3. Check (on UPS panel) that the batteries are charging. Do not attempt to restart the system unless the batteries have been recharged.<br>3. Restart the system.<br>3. If the problem persists, contact GEMS Field Service. |
| AA 7                                                    | "Senograph failure, exam forbidden"                    | A Senographe (DMR) subsystem is not ready for acquisition after start-up.                                                                                                                                                           | 1. Wait to see if the problem clears.<br>2. If the problem persists, contact GEMS Field Service.                                                                                                                                                                                                                   |
| AA 8                                                    | "Shutdown Process started ..."                         | The AWS shutdown process has been started because a UPS primary power failure longer than 10 seconds has been detected.                                                                                                             | 1. Wait for the end of the shutdown sequence.<br>2. Check mains power supply.<br>3. Restart the system when power OK.<br>4. If the problem persists, contact GEMS Field Service.                                                                                                                                   |
| AA 9                                                    | "Shutdown Process started ..."                         | The AWS shutdown process has been started because communication with the UPS was lost for more than 30 seconds.                                                                                                                     | 1. Stop system usage and wait for the end of the shutdown sequence.<br>2. Restart the system<br>3. If the problem persists, contact GEMS Field Service.                                                                                                                                                            |

| Message on AWS screen                                 |                                                                                                                                       | Explanation                                                                                                                                                                                          | Corrective action                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AA 10                                                 | "Shutdown Process started ..."                                                                                                        | The AWS shutdown process has been started because a UPS low battery condition was detected (battery power must be available to guarantee safe operation and shutdown in the event of power failure). | 1. Stop system usage and wait for the end of the shutdown sequence.<br>2. Check the mains power supply.<br>3. Check (on UPS panel) that the batteries are charging. Do not attempt to restart the system until the batteries have recharged.<br>4. If the problem persists, contact GEMS Field Service. |
| AA 11                                                 | System is down.<br>System will power off within 30 seconds: do NOT reboot now! (if system does not turn off, switch off UPS manually) | The message is displayed at the end of the normal shutdown sequence, when the UPS is about to shut down, to prevent users from trying to reboot.                                                     | No action is normally required.<br>If the system fails to shut down completely (the AWS screen continues to display the message after one or two minutes), switch it off by pressing the <b>UPS OFF</b> button at the front of the Generator Cabinet.                                                   |
| AA 12                                                 | "System not ready, exam forbidden"                                                                                                    | A system component is not yet ready (after system start-up).                                                                                                                                         | Wait until system initialization is complete before requesting an acquisition.                                                                                                                                                                                                                          |
| AA 13                                                 | UPS battery needs replacing.<br>Please call service                                                                                   | The UPS selftest has detected that the battery requires replacement.                                                                                                                                 | Stop system usage and contact GEMS Field Service.                                                                                                                                                                                                                                                       |
| AA 14                                                 | UPS output overload.<br>Please call service                                                                                           | An UPS overload condition has been detected.                                                                                                                                                         | Stop system usage and contact GEMS Field Service.                                                                                                                                                                                                                                                       |
| <b>BB</b> These messages relate to boot/reset events: |                                                                                                                                       |                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                         |
| BB 1                                                  | "AWS – IDC communication failure, exam forbidden."                                                                                    | Communication between the AWS and the acquisition system was not established at boot time, or has been lost during application.                                                                      | 1. Click <b>OK</b> on the pop-up window<br>2. Restart the Browser.<br>3. If the message is repeated, perform system shutdown and restart the system.<br>4. If the problem persists, contact GEMS Field Service.                                                                                         |
| BB 2                                                  | AWS/SENO communication failure, exam forbidden                                                                                        | Communication between the AWS and the Gantry system was not established at boot time, or has been lost during application.                                                                           | 1. Click <b>OK</b> on the pop-up window<br>2. Reset the gantry (power OFF/ON), and/or restart the Browser.<br>3. If the message is repeated, perform system shutdown and restart the system.<br>4. If the problem persists, contact GEMS Field Service.                                                 |
| BB 3                                                  | AWS not functional, exam forbidden                                                                                                    | One of the system components did not boot (or did not reset) correctly.                                                                                                                              | 1. Click <b>OK</b> on the pop-up window<br>2. Restart the Browser.<br>3. If the message is repeated, perform system shutdown and restart the system.<br>4. If the problem persists, contact GEMS Field Service.                                                                                         |

| Message on AWS screen                                                |                                                                                                                          | Explanation                                                                                                                                                     | Corrective action                                                                                                                                                                                                          |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BB<br>4                                                              | "AWS reset in progress:<br>please wait"                                                                                  | An AWS boot or reset sequence is in progress.<br>The AWS may start an automatic reset if it detects an internal acquisition device error.                       | Wait until system initialization is complete.<br><br>If several automatic resets occur, contact GEMS Field Service.                                                                                                        |
| BB<br>5                                                              | "AWS reset successful,<br>System is operational"                                                                         | The AWS boot or reset sequence has been successfully completed                                                                                                  | No action required (click <b>OK</b> to close the pop-up window).                                                                                                                                                           |
| BB<br>6                                                              | Communication with UPS not established. Please call service. System will power off within 30 seconds: do NOT log in now! | This message is displayed at the end of the power-up/boot sequence, if communication cannot be established with the UPS.                                        | 1. Wait for the end of the shutdown sequence.<br>2. Try to restart the system .<br>3. If the problem is repeated, contact GEMS Field Service.                                                                              |
| BB<br>7                                                              | IDC/SENO communication failure, exam forbidden                                                                           | Communication between the IDC and the Gantry system was not established at boot time, or has been lost during application.                                      | 1. Click <b>OK</b> on the pop-up window<br>2. Reset the gantry (power OFF/ON)<br>3. If the message is repeated, perform system shutdown and restart the system.<br>4. If the problem persists, contact GEMS Field Service. |
| BB<br>8                                                              | "Remote connection in progress : do not acquire images"                                                                  | A GE Insite connection is in progress; no new images should be acquired.                                                                                        | No action is required; wait for completion of the connection.                                                                                                                                                              |
| BB<br>9                                                              | Restart browser must be performed to take into account the new configuration                                             | Medical Application Preferences settings have been changed, and Save has been requested. The changes will not take effect until the Browser has been restarted. | Restart the Browser.                                                                                                                                                                                                       |
| BB<br>10                                                             | System currently performing self-testing – Please Wait.                                                                  | The system is busy with internal checks and tests.                                                                                                              | No action required; wait for completion of the test.                                                                                                                                                                       |
| <b>CC</b> These messages relate to internal disk or memory problems: |                                                                                                                          |                                                                                                                                                                 |                                                                                                                                                                                                                            |
| CC<br>1                                                              | "ATTENTION Not enough space to continue"                                                                                 | Image disk is full.                                                                                                                                             | 1. Increase free space on image disk by deleting exams that have been archived.<br>2. If the problem persists, contact GEMS Field Service.                                                                                 |
| CC<br>2                                                              | "AWS not available for acquisition, exam forbidden"                                                                      | The Medical Application cannot allow acquisition because of lack of disk space or an uncomplete action on the AWS                                               | 1. Check that all actions are complete (e.g., close all pop-up windows) and<br>2. Increase free space on image disk by deleting exams that have been archived.<br>2. If the problem persists, contact GEMS Field Service.  |
| CC<br>3                                                              | Disk space is full, you cannot perform a new exam                                                                        | Image disk is full.                                                                                                                                             | 1. Increase free space on image disk by deleting exams that have been archived.<br>2. If the problem persists, contact GEMS Field Service.                                                                                 |

| Message on AWS screen |                                                                                                   | Explanation                                                                                             | Corrective action                                                                                                                                                                                                |
|-----------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CC 4                  | Image update failed on disk.<br>You cannot save your last changes to the exam.                    | Image disk is full or server has failed.                                                                | 1. Close exam.<br>2. Increase free space on image disk by deleting exams that have been archived.<br>3. If the problem persists, contact GEMS Field Service.                                                     |
| CC 5                  | Medical Preferences Application was unable to get last settings                                   | The file containing Medical Application Preferences settings does not exist or has been corrupted.      |                                                                                                                                                                                                                  |
| CC 6                  | Medical Preferences Application was unable to save current settings                               | The new Medical Application Preferences settings could not be saved, probably because of lack of space. | 1. Increase free space on image disk by deleting exams that have been archived.<br>2. If the problem persists, contact GEMS Field Service.                                                                       |
| CC 7                  | Out of Memory, exam forbidden                                                                     | System requirements exceed available AWS memory.<br>It is still possible to perform film examinations.  | 1. Perform system shutdown.<br>2. Start up system.<br>3. If the problem persists, contact GEMS Field Service.                                                                                                    |
| CC 8                  | Reallocation of disk space failed. There is no space available on disk for acquiring more images. | Image disk is full or server has failed.                                                                | 1. Close exam.<br>2. Increase free space on image disk by deleting exams that have been archived.<br>3. Perform system shutdown, then restart system.<br>4. If the problem persists, contact GEMS Field Service. |
| CC 9                  | System disk is full                                                                               | System disk is full.                                                                                    | 1. Close exam.<br>2. Increase free space on image disk by deleting exams that have been archived.<br>3. Perform system shutdown, then restart system.<br>4. If the problem persists, contact GEMS Field Service. |
| CC 10                 | The DICOM image construction failed.                                                              | The system is not able to format acquired image                                                         | 1. Close exam.<br>2. Increase free space on image disk by deleting exams that have been archived.<br>3. If the problem persists, contact GEMS Field Service.                                                     |

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## CHAPTER 15 – SPECIFICATIONS

### 1. TECHNICAL SPECIFICATIONS

#### 1-1 Electrical Specification

Mode of operation: Continuous operation with intermittent loading.

##### 1-1-1 Line voltage specifications

- Single-phase input voltage (phase-neutral or phase-phase):
  - 200/208/220/240/380/415 V ( $\pm 10\%$ )
- Can be powered by single-phase 440 V ( $\pm 10\%$ ) using optional transformer.
- Line frequency specifications 50 or 60 Hz ( $\pm 5\%$ )
- Protection against electrical shocks: class 1, type B.
- The maximum line current corresponds to the use of the technique factors 30 kV, Mo track, large focal spot, and 100 mAs.

##### 1-1-2 kVA load characteristics

- Maximum power in standby: 1.5 kVA.
- Maximum instantaneous power (during exposures, up to 6 seconds) 9 kVA.
- Power factor: 0.6
- Line current crest factor: 1.7 at 200 V to 2 at 415 V.

##### 1-1-3 Input impedance

The apparent resistance of the mains supply  $R_L$  must be less than that which would cause a voltage drop of 6% at the maximum power load of 9 kVA.

For a nominal supply voltage of 380 V, the line resistance  $R_{L(380)}$  must be less than 1  $\Omega$ :

$$R_{L(380)} \leq 1 \Omega$$

For other supply voltages, calculate the equivalent permissible resistance value in ohms as follows:

$$R_{L(U)} = R_{L(380)} \times (U/380)$$

Where: U = local input voltage

$R_{L(U)}$  = total apparent resistance (two-wire) of the supply at the local voltage (U).

$R_{L(380)}$  = total apparent resistance (two-wire) of the supply at 380 V.

Thus, as  $R_{L(380)}$  must be less than 1  $\Omega$ , the value of  $R_{L(U)}$  must be less than (U/380).

##### 1-1-4 Generator Output (excluding tube)

- 22 thru 49 kV,
- 20 thru 130 mA.

##### 1-1-5 Duty Cycle

The generator is always limited by the tube:

- The generator can supply a maximum of 100 W to the tube.  
This example represents one 30 kV/200mAs exposure each minute.

### 1-1-6 Line Conditioner Resonance Frequency

- 20 kHz approx.

### 1-1-7 Generator Power (excluding tube)

- 5 kW maximum.

## 1-2 Maximum Tolerance of Displayed Constants

### kV and mAs:

- kV:  $\pm 5\%$
- mAs:  $\pm 7.6\% \pm 1.1$  mAs

### Measurement Conditions:

- kVp: Connect an HV voltage divider (Machlett Dynalizer IIIA; ratio 10 kV/1 V) in series with the x-ray tube and measure the voltage with a multimeter (Fluke 47)
- mAs: Connect an HV voltage divider (Machlett Dynalizer IIIA; ratio 10 kV/1 V) in series with the x-ray tube. Connect a waveform analyzer (Tektronix 7854) to the output of the divider; the analyzer receives a signal proportional to the voltage applied to the tube. The mAs values are given by:

$$\text{mAs} = \int_{T1}^{T2} i \, dt$$

Where T1 is the time at which the high voltage reaches 75% of its maximum value, and T is the time at which the high voltage returns to 75% of the maximum value.

### Compression Force and Breast Thickness:

- Compression Force:  $\pm 10$  newton
- Breast Thickness  $\pm 10$  mm

## 1-3 Workstation Storage

Total internal disk capacity: two disks, each of 9 Gbytes.

Allocated for image storage: 14 Gbytes (corresponding to approximately 1650 images).

## 1-4 Digital Detector FOV

Field of View (FOV) of the Digital Detector: 19 cm x 23 cm.

## 2. RADIATION AND FILTER INFORMATION

### 2-1 Radiation Reference Axis

Conforming to standard mammography practice, the radiation reference axis is directed at the chest wall edge of the digital detector; radiation is shielded so that there is no radiation directed behind the chest wall.

### 2-2 Technical Leakage Factor

With respect to radiation regulation, the tube housing and the collimator are in compliance with DHHS 21 CFR1020: Technical leakage factors applicable: 49 kV at 2 mA.

### 2-3 Filters and Anode Tracks

Maximum current for each track/focal spot configuration:

| <div>TRACK</div> <div>FOCAL SPOT</div> | Mo          | Rh         |
|----------------------------------------|-------------|------------|
| Large                                  | 100 mA max. | 75 mA max. |
| Small                                  | 40 mA max.  | 40 mA max. |

The filters are installed on a disk driven by a stepping motor which moves from one filter to the other.

Two different filters are supplied:

- Molybdenum: 0.03 mm,
- Rhodium: 0.025 mm,

**Note:** The Column electronics control the filters according to operator requirements in manual mode, or to software requirements in AOP mode.

| TARGET     | VOLTAGE<br>(kV) | FILTER   | HALF-VALUE LAYER   |
|------------|-----------------|----------|--------------------|
| Molybdenum | 30              | 0.03 Mo  | 0.3 mm Al minimum  |
|            | 30              | 0.025 Rh | 0.35 mm Al minimum |
| Rhodium    | 30              | 0.025 Rh | 0.4 mm Al minimum  |

The minimum filtration permanently installed in the useful beam is 0.008 mm Al (8  $\mu$ m Al) at 30 kV (corresponding to 0.69 mm Beryllium).

## 2-4 Attenuation Equivalence

Attenuation equivalence for components in the X-ray beam (in accordance with FDA HHS 21 CFR, § 1020.30; measurements made at a potential of 100 kVp, using an X-ray beam with an HVL of 2.7 mm of aluminum).

| Component              | Al equivalence (mm) |
|------------------------|---------------------|
| Magnification device   | less than 0.2       |
| Image receptor support | less than 0.3       |
| Bucky                  | less than 0.3       |

## 3. AMBIENT CONDITIONS

### 3-1 Operational Ambient Conditions

- Humidity: 10% min., 80% max.
- Temperature 15°C (59°F) min., 35°C (95°F) max.
- Atmospheric pressure: 700 hPa min., 1060 hPa max.

### 3-2 Transport and Storage Ambient Conditions

- Humidity: 10% min., 50% max.  
95% max. no longer than two weeks.
- Temperature +10°C (50°F) min., 25°C (77°F) max.  
-10°C (14°F), 50°C (122°F) no longer than 1 day.
- Atmospheric pressure: 500 hPa min., 1060 hPa max.

### 3-3 Ambient Light Level

Senographe 2000 D monitors are adjusted for use in an optimum light level of 50 lux.

## 4. TUBE INFORMATION

Tube Cooling Curves and other tube-specific technical parameters can be found in the Tube Product Data document, part no. 2106037-100, included with the system documentation.

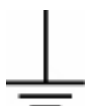
## 5. DIMENSIONS AND WEIGHTS

| COMPONENT                     | DIMENSIONS in mm ( <i>inches</i> ) |        |       |        |                       |                        | WEIGHT<br>in kg ( <i>pounds</i> ) |       |
|-------------------------------|------------------------------------|--------|-------|--------|-----------------------|------------------------|-----------------------------------|-------|
|                               | Length                             |        | Width |        | Height                |                        |                                   |       |
| Gantry                        | 1200                               | (47.5) | 540   | (21.5) | min.1710<br>max. 2410 | (min. 67.5<br>max. 95) | 280                               | (616) |
| Console                       | 550                                | (22)   | 180   | (7)    | 85                    | (3.5)                  | 3                                 | (7)   |
| Generator cabinet             | 562                                | (22.5) | 431   | (17)   | 1320                  | (52)                   | 180                               | (396) |
| Rad Shield screen + console   | 700                                | (27.5) | 490   | (19.5) | 2200                  | (86.5)                 | 90                                | (198) |
| Senographe 2000 D accessories | 900                                | (35.5) | 500   | (20)   | 890                   | (35)                   | 50                                | (110) |
| AWS – cart                    | 1060                               | (42)   | 650   | (25.5) | 1088                  | (43)                   | 230                               | (506) |
| AWS – monitor                 | 460                                | (18)   | 350   | (14)   | 450                   | (18)                   | 30                                | (66)  |

## 6. MEANING OF SYMBOLS



Protective earth (ground)



Earth (ground)



Dangerous voltage



Type B equipment



This symbol indicates that waste electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

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## REVISION HISTORY

| REV | DATE         | REASON FOR CHANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | May 31, 2006 | <p>New release based on document 5128687-2-100 rev. 1, with the following changes:</p> <p>Medical Application preferences section (section 8-3 of Browser chapter) modified to show Image Process tab and to describe selection of Premium View option.</p> <p>Processing section (section 10 of Image Acquisition Procedure chapter) modified to describe the Premium View option.</p> <p>Maintenance chapter modified to include revised monitor cleaning instructions and planned maintenance procedures.</p> <p>Removed list of addresses of GE Medical Systems Service offices. Updated cover pages.</p> |

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| NUMBER           | SIZE | REVISION |
|------------------|------|----------|
| 5179217-1-100TPH | A4   | 1        |

Manufactured by:  
GE Medical System SCS  
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